Subchapter 2.12—HP 9000 Superdome Servers: 16-way, 32-way, and 64-way

Overview

This guide pertains to all Superdome servers for all markets. With Superdome, HP launches a new strategy to ensure a positive Total Customer Experience is achieved via industry-leading HP Services. Our experience has shown us that large solution implementations most often fail as a result of inadequate skills being applied to the solution design and implementation. To address this on the implementation side, for Superdome, HP is responding to Customer and Industry feedback and delivering Superdome Configurations via three, pre-configured Services levels: Business Continuity, Critical Systems and Foundation. With Superdome, we introduce a new role, the Solution Manager, who manages the fulfillment of an integrated business solution based on customer requirements. The Solution Manager for the account will facilitate the selection of the appropriate configuration. For ordering instructions, please consult the ordering guide.

Superdome Foundation Configuration—"Built Right the First Time"

HP recognizes that building the right Foundation dramatically reduces problems and speeds time to production, so all Superdome solutions will include the Foundation Configuration as the sturdy base for optimum production. Foundation is intended for those customers whose applications aren't critical to their business success and therefore have lower needs for availability or have the in-house expertise to run and manage their IT environments. The Superdome Foundation Configuration includes:

- Up-front project coordination from HP for closed-loop solution management through disciplined, repeatable, process-based methodology and mechanisms and measurements to ensure customer success and satisfaction (the Solution Manager role, discussed above)
- Consulting services for a detailed architecture design to get it right the first time
- Skills assessment and Superdome-specific education to provide one IT staff person with the skills needed for optimal implementation and administration.
- Comprehensive site/environmental preparation to help customers understand and address the demands of the solution on their physical environment.
- Factory integration and testing to ensure that the solution is configured just right and arrives ready-to-run.
- Customer acceptance process to ensure satisfaction
- Foundation-level support program to help minimize the effects of unplanned downtime when problems occur, available 24×7 with a four-hour response.
- System fault management using the Event Notifier technology to help increase system availability and uptime through early detection and notification of failure events.

When a Surestore XP Disk Array is purchased with Superdome, Foundation Services will cover the disk array as well, to ensure it is "Always Up, Always Available". HP's service and support offerings provide a robust level of bundled support (during the two-year warranty period) for the HP Surestore XP Disk Array. This includes a hardware support level called Availability Support, as well as Site Prep and Installation. We have also bundled in the support service called LUN/SW Initial Enablement and Implementation Service that provides a basic LUN map design and implementation and a software implementation service that ensures the basic purchased software products are installed and functional.

In addition to the bundled support provided with each frame purchase two additional support services are required:

- Every software product, on each frame, must be ordered with support option #0S6, which provides 24×7 Phone-in Assistance, License-to-Use Software and Documentation Updates, and access to the IT Resource Center (ITRC, formerly ESC)
- For the more complex software products option #0SY is also required to ensure installation and basic functionality.

Finally, based on our experience in mission critical environments, we highly recommend several services including Technical Account Services for Storage (TAS), storage focused account management and technical services. These other services and more detail on Foundation Support for the Surestore XP Disk Array can be found in **Subchapter 4.7** of this guide.

Critical Systems Configuration—"Gateway to Mission Critical"

For customers that need a high-level of system availability, HP's industry-recognized experience providing mission critical support is the basis for the Critical Systems Configuration. Focusing on the system itself and the people and processes that affect its stability and reliability, Critical Systems Configuration is the entry-level for mission critical. It increases the priority of reactive services and adds proactive support services with availability monitoring, an account support plan and a six-hour call-to-repair commitment.

Critical Systems Configuration includes the foundation basics plus:
- Account support plan that details the specific requirements of the account and the HP response
- Assigned Account Engineers (Account Support Engineer, Customer Engineer and Response Center Account Advocate)
- e-Readiness Assessment to help customers meet the challenges of the high availability performance computing with a solution that fits the present and future needs of their business.
- Skills assessment and Superdome-specific education for three people
- Quarterly account reviews
- Quarterly patch management
- Two Technical Consulting Seminars of choice such as:
  - Change management services
  - Change Planning
  - Operating system update planning
- High Availability Observatory
  - High-speed remote diagnostics
  - Critical Data collection
- Reactive Hardware Support 6-hour Call-to-Repair (CTR)
- Priority System Recovery (PSR)
- Optional Business Recovery Services (BRS)

The Surestore XP Disk Array can be fully integrated into new and existing Mission Critical server environments. Since there are zone restrictions, the local delivery team should work with GSL to determine if a customer's site is within criteria. Mission Critical support provides storage focused proactive services above and beyond standard warranty deliverables:
- Technical Account Services
- Single point of failure analysis
- On site installation
- Integrated storage section in the Account Support Plan
- Assigned Storage Trained Account Engineers
- 6 hour Call To Repair commitment (zone restricted) for hard down situations (redundant components are not covered under CTR commitments)
- Integrated Storage Patch Analysis
- Priority System Recovery
- Optional on-site parts kit

For more information on how to order Critical Systems Support on the Surestore XP Disk Array, refer to the **Subchapter 4.7** of this guide.

Business Continuity Configuration—"Partnering to Optimize Your Business"

Superdome's Business Continuity Configuration delivers more than a list of services. It delivers a different way to approach availability planning. Business Continuity is a collaboration between HP and the customer that creates a plan to proactively address all of the elements in the IT environment that effect business availability. Commercial operations and other customers whose success depends on their IT solution need the highest availability, performance, security, scalability, and manageability possible. The Business Continuity Configuration gives them the solution they need and the "high touch" level of experience they expect. The solution is designed and built with the goal of maximum availability. The focus is on "keep it running" with tailored consulting, education, and support. Business Continuity provides sophisticated, proactive services and the industry's best "fix it fast" support when problems occur. The Business Continuity Configuration provides the only four-hour call-to-restoration commitment available in the market.

The Business Continuity Configuration includes the upfront services of Foundation and Critical Systems with a partnership approach that covers:

- Active participation of an HP team that is part of the customer IT team
- Customized proactive services plan that thoroughly addresses the specifics of the solution
- Highest priority, immediate access to trained specialists
- Highly detailed change management
- Four Technical Consulting Seminars of choice
- Skills assessment and Superdome-specific education for six people total
- Monthly account reviews to ensure solution needs are continuously addressed
- Monthly patch management with daily screen for critical patches
- 4-hour hardware and software call-to-restoration
- Permanent software solution within 14 days
- Custom, personalized escalation
- R&D mobilization 7 days/week

Business Continuity Support must be purchased as a standalone support agreement for the Surestore XP Disk Array purchased with Superdome. The deliverables of Foundation Support and Critical System Support are included with Business Continuity Support, along with the following:

- 4 hour Call to Restoration
- Priority System Recovery
- On site parts kit

For more information about how to order a Business Continuity support agreement for the Surestore XP Disk Array, contact your Support Agreement Specialist.

In addition, for Mission Critical Customers, we highly recommend HP Business Recovery Services that are available at a special price for Superdome customers. Business Recovery Critical Service includes provision in the event of any disaster of a fully configured, equivalent or more powerful Superdome environment at one of HP's Recovery Centers within 7 hours of the disaster, and also includes one annual disaster rehearsal.

Table 2.12.1 Superdome Specifications

SPU model number	**Superdome 16-way**	**Superdome 32-way**	**Superdome 64-way**
SPU product number	**A6113A**	**A5201A**	**A5201A+A5202A**
TPC-C disclosure	Not disclosed	Not disclosed	+389,434 tpm
Number of CPUs	1-16	1-32	8-64
PA-RISC Processor	PA-8600/PA-8700	PA-8600/PA-8700	PA-8600/PA-8700
Clock speed (MHz) (PA-8600/PA-8700)	552 MHz/750 MHz, 875 MHz	552 MHz/750 MHz, 875 MHz	552 MHz/750 MHz, 875 MHz
Memory (with 512-Mbit DRAM DIMMs)	2-64 GB	2-128 GB	16-256 GB
Cells	1-4	1-8	8-16
PCI slots without I/O expansion cabinet	12-48	12-48	48-96
12-slot PCI I/O chassis without I/O expansion cabinet	1-4	1-4	4-8
PCI slots with I/O expansion cabinet	N/A	24-96	48-192 (a second I/O expansion cabinet is required for if number of PCI slots is greater than 168)
12-slot PCI I/O chassis with I/O expansion cabinet Note: SPU cabinet must be filled first before placing I/O chassis in I/O expansion cabinet	N/A	8	16 (a second I/O expansion cabinet is required if number of I/O chassis is greater than 14)
Number of Partitions without I/O expansion cabinet	1-4	1-4	1-8
Number of Partitions with I/O expansion cabinet	1-4	1-8	1-16
Earliest HP-UX revision	HP-UX 11i	HP-UX 11i	HP-UX 11i
Software tier			
Standard Integrated I/O			
RS-232C Serial Ports	Y	Y	Y
10/100Base-T Ethernet	Y	Y	Y
Internal Capacities			
DRAM Density (Mb)	512	512	512
Base RAM (GB)	2	2	16
Max. RAM capacity (GB)	64	128	256
Site Preparation			
Site planning and installation included	Y	Y	Y
Maximum Heat dissipation (BTUs/hour)	28,950	41,588	83,177
Depth (mm)	1,220	1,220	1,220
Width (mm)	762	762	1,524
Height (mm)	1,960	1,960	1,960
Weight (Kg)	500	598	1,196
Maximum External Capacities			
Mass Storage Arrays			
XP256			
XP256+ (A5700A)			
XP512			
EMC 3730			
EMC 3700			
EMC 3500			
EMC 3430			
EMC 3400			
EMC 3330			
EMC 3300			
EMC 3230			
EMC 3200			
EMC 3130			
EMC 3100			
Model 30			
Auto RAID			
Surestore Disk Array FC60 (A5277AZ)			

Table 2.12.1 Superdome Specifications (continued)

SPU model number	Superdome 16-way	Superdome 32-way	Superdome 64-way
SPU product number	**A6113A**	**A5201A**	**A5201A+A5202A**
Mass Storage Enclosures			
High Availability Storage System (A3312AZ)			
Surestore Disk System HVD10 (A5616AZ)			
Surestore Disk System FC10 (A5236AZ)			
Surestore Disk System SC10 (A5272AZ)			
Surestore Disk System 2100 (A5675AZ)			
Surestore Disk System 2300 (A6490AZ)			
Surestore Disk System 2405 (A6250AZ) Note: There are limitations in using the 2G FC in direct attach mode with the DS2405. The customer will only be able to boot in 1G mode with this device.			
Mass Storage Single Spindle Disks			
> =2-GB 7200 SCSI Disks			
10,000 RPM SCSI Disks			
7,200 RPM FC Disks			
10,000 RPM FC Disks			
Mass Storage Optical Jukeboxes			
660ex 4 drives			
660x 6 drives			
1200ex 10 drives			
1200ex 4 drives			
5200ex drive			
160ex 2 drives			
320ex 4 drives			
400ex 2 drives			
Mass Storage Tape Libraries			
STK 9490			
STK SD-3			
DLT Library 10/560, 6/100, 3/30			
DLT Library 2/15			
Mass Storage Tape Devices (order TA5300 and TA5500)			
DDS-3 Autoloader			
DDS-3			
DDS-4			
DLTVS80			
ULTRIUM 215,230			
DLT220			
DLT-7000			
IBM 3590			
STK Eagle			
LTO			
DVD and Tapes			
C7499A option OD1 (DVD-ROM) used in TA5300			
C7508AZ (racked TA5300 tape and DVD chassis)			
C1354AZ (racked TA5500 tape chassis)			
Mass Storage Infrastructure			
FC Hub 1X and 2X			
FC/SCSI MUX			
FC Switch 1X and 2X			
SE/FWD SCSI Converter (not in the base configuration any more)			

Table 2.12.1 Superdome Specifications (continued)

SPU model number	**Superdome 16-way**	**Superdome 32-way**	**Superdome 64-way**
SPU product number	**A6113A**	**A5201A**	**A5201A+A5202A**
Maximum I/O and Networking Cards (maximum numbers in parentheses are supported once I/O expansion cabinet is available) 1. If product number A5207A is ordered, one set of I/O and networking paper documentation will be received. If A5207A is not ordered, no paper documentation will be received. The I/O and networking documentation will always be available on a CD. The AVN option is no longer available with Superdome Enterprise Servers. 2. The maximum number of A4800A includes core I/O.			
On-Line Addition/Replacement Capability (OLAR) All cards listed below have the OLAR capability except for HIPPI (A5801A), and SNA over X.25. Additional, the Superdome core I/O card in slot 0 does not support OLAR. Note: X.25 dual-port (J3525A) needs separate cables for each card port (2 ports per card).			
A5159A Fast/Wide SCSI (dual port)	24	48	96
A6828A PCI Single-port Ultra160 SCSI (Available August 2002)	48	96	96 (192)
A6829A PCI Dual-port Ultra160 SCSI (Available August 2002)	48	96	96 (192)
A4926A 1000Base-SX	16	32	64
A4929A 1000Base-T	16	32	64
A5230A 10/100Base-TX (RJ-45)	24	48	96
A6092A HyperFabric (PCI 4X)	8	8	8
A3739B FDDI Dual Attach	16	32	64
A5513A ATM155 (MMF)	8	16	32
A5483A ATM622 (MMF)	8	16	32
A5515A ATM155 (UTP5)	8	16	32
A5783A Token Ring LAN (4/16/100 Mb/s)	8	16	32
J3525A X.25 (PSI dual port) See Note 1 above	8	16	32
J3526A X.25 (quad-port)	8	16	32
J3592A Terminal MUX (8-port)	8	16	32
J3593A Terminal MUX (64-port)	8	16	32
A4800A Fast/Wide SCSI	48	48 (96)	96 (192)
A5801A HIPPI (no factory integration)	4	8	16
A5486A PKC (Public Key Cryptography)	8	16	32
A5506B 10/100Base-TX (quad-port)	8	16	32
A5838A Dual-port Ultra2 SCSI+Dual-port 100Base-T	8	16	32
A6386A PCI HyperFabric2 fiber adapter (PCI 4X)	8	8	8
A6748A PCI 8-port serial MUX adapter	8	14	14
A6749A PCI 64-port serial MUX adapter	8	14	14
A6825A PCI 1000Base-T Gigabit Ethernet adapter (Available August 2002)	16	32	64
A6847A PCI 1000Base-SX Gigabit Ethernet adapter (Available August 2002)	16	32	64
A6795A PCI 2-Gb Fibre Channel adapter	48	48 (96)	96 (192)
Electrical Characteristics			
AC input power—Option 7: 3-phase 5-wire input	200-240 VAC phase to neutral, 5-wire, 50/60 Hz		
AC input power—Option 6: 3-phase 4-wire input	200-240 VAC phase to phase, 4-wire, 50/60 Hz		
Current requirements at 220V-240V:			
Option 7: 3-phase 5-wire input	24 A	24 A	24 A
Option 6: 3-phase 4-wire input	44 A	44 A	44 A
Required Power Receptacle—Options 1 and 2	N/A. Electrician must hard-wire power to the cabinet.		
Required Power Receptacle—Options 6 and 7	None. Cord, plug and included. Receptacle should be ordered separately. Electrician must hard-wire receptacle to site power.		
Maximum Input Power (watts)	8,490	12,196	24,392

Table 2.12.1 Superdome Specifications (continued)

SPU model number	Superdome 16-way	Superdome 32-way	Superdome 64-way
SPU product number	**A6113A**	**A5201A**	**A5201A+A5202A**
Environmental Characteristics			
Acoustics	65 dB	65 dB	65 dB
Operating temperature	+20°C to +30°C	+20°C to +30°C	+20°C to +30°C
Non-operating temperature	–40°C to +70°C	–40°C to +70°C	–40°C to +70°C
Maximum rate of temperature change	20°C/hr	20°C/hr	20°C/hr
Operating relative humidity	15% to 80% @ 30°C	15% to 80% @ 30°C	15% to 80% @ 30°C
Operating altitude	0-3.1 km (0-10,000 ft)	0-3.1 km (0-10,000 ft)	0-3.1 km (0-10,000 ft)
Non-operating altitude	0-4.6 km (0-15,000 ft)	0-4.6 km (0-15,000 ft)	0-4.6 km (0-15,000 ft)
Regulatory Compliance			
Safety	IEC 950:1991+A1, +A2, +A3, +A4; EN60950:1992+A1, +A2, +A3, +A4, +A11; UL 1950, 3rd edition; cUL CSA-C22.2 No. 950-95	IEC 950:1991+A1, +A2, +A3, +A4; EN60950:1992+A1, +A2, +A3, +A4, +A11; UL 1950, 3rd edition; cUL CSA-C22.2 No. 950-95	IEC 950:1991+A1, +A2, +A3, +A4; EN60950:1992+A1, +A2, +A3, +A4, +A11; UL 1950, 3rd edition; cUL CSA-C22.2 No. 950-95
Key Dates			
First CPL date	9/00	9/00	9/00
First ship date	4Q00	4Q00	1Q01

Table 2.12.2 Superdome I/O Expansion (IOX) Cabinet Specifications

Max number of I/O Chassis Enclosures (ICEs)*	3
Dimensions	
Height	1.6 meters or 1.96 meters
Depth	45.5 in (same depth as 32W)
Width	24.0 in
Electrical Characteristics	
AC input power	200-240 VAC, 50/60 Hz
Current requirements at 200V-240V	16 A
Typical maximum power dissipation (watts)	2290
Maximum power dissipation (watts)	3200
Environmental Characteristics	Same as Superdome
Peripherals Supported	All peripherals qualified for use with Superdome and/or for use in an RBII-D (ask Jill Gentry for official name) rack are supported in the I/O expansion cabinet as long as there is available space. Peripherals not connected to or associated with the Superdome system to which the I/O expansion cabinet is attached may be installed in the I/O expansion cabinet.
Servers Supported	No servers except those required for Superdome system management such as Superdome Support Management Station (A-500) or High Availability Observatory may be installed in an I/O expansion cabinet.
Superdome Models Supported	Superdome 32-way Superdome 64-way
Relevant Product Numbers	
12-slot PCI Chassis for Rack System E Expansion Cabinet	A4856AZ
I/O expansion cabinet Power and Utilities Subsystem	A5861A
I/O Chassis Enclosure for 12-slot PCI Chassis	A5862A
Key Dates	
First CPL Date	9/00
First Ship Date	2Q01

* Each ICE holds two I/O card cages or 24 PCI I/O slots.

Description

Superdome System Planner

The Superdome System Planner is an application environment comprised of infrastructure and tool components designed to give the field Technical Consultant the resources to design multiple site, multiple partition Superdome servers. The System Planner can be used to quickly capture system deal information and easily propose valid Superdome configurations and their alternatives. The System Planner is used in the sales process to **help the customer decide** on the solution they require by giving visual feedback in order to reinforce the purchasing decision.

The System Planner begins with the all-important step of collecting the customer's requirements, customer and sales team contact information, and notes about the opportunity. Using the information gathered about the customer's applications, the tool helps capture and graphically represent Superdome server complex(es) from logical descriptions. It shows the loading of Superdome complex components as well as expansion capability. Multiple sites may be configured to portray interconnection. When entry is complete, the System Planner validates the design to ensure that all necessary Superdome components are included and properly placed.

Finally, the System Planner reporting feature takes all of the input requirements, contact information, system data and calculated information and formats it into an MS-Word document. The document is consistent with the GSS High Availability Solution Plan (HASP) format and is customer presentable. Key to helping the customer visualize the solution is detailed graphical representations of the Superdome complexes. Overview and backplane diagrams are created in Visio format and incorporated into the System Plan.

The information in this section of the Configuration Guide is all provided in the System Planner.

Features

System	Minimum System	Maximum SPU Capacities	Standard Features	Standard HP-UX Features	Standard Services and Support
Superdome 16-way	• 1 CPU (PA-8600 or PA-8700) • 2-GB Memory (128-MB DRAM) • 1 Cell Board • 1 12-slot PCI Chassis (12 PCI Card Slots)	• 16 CPU (PA-8600 or PA-8700) • 64-GB Memory (128-MB DRAM) • 4 Cell Boards • 4 12-slot PCI Chassis (48 PCI Card Slots)	• Redundant Power supply • Redundant Fans • HP-UX operating system with unlimited user license • Factory integration of memory and I/O cards • Installation Guide, Operator's Guide and Architecture Manual • HP site planning and installation • One-year warranty with same business day on-site service response	• HP-UX 11i Mission Critical Edition • HP-UX 11i Enterprise Edition • HP-UX 11i Internet Edition	Included with choice of configuration as described above: • Foundation • Critical Systems • Business Continuity
Superdome 32-way	• 1 CPU (PA-8600 or PA-8700) • 2-GB memory (128-MB DRAM) • 1 Cell Board • 1 12-slot PCI Chassis (12 PCI Card Slots)	• 32 CPU (PA-8600 or PA-8700) • 128-GB memory (128-MB DRAM) • 8 Cell Boards • 8 12-slot PCI Chassis (96 PCI Card Slots)			
Superdome 64-way	• 8 CPU (PA-8600 or PA-8700) • 16-GB memory (128-MB DRAM) • 8 Cell Boards • 4 12-slot PCI Chassis (48 PCI Card Slots)	• 64 CPU (PA-8600 or PA-8700) • 256-GB Memory (128-MB DRAM) • 16 Cell Boards • 16 12-slot PCI Chassis (192 PCI Card Slots)			

Configuration

There are three basic building blocks in the Superdome system architecture: the cell, the crossbar backplane and the PCI-based I/O subsystem. Below is a high-level illustration of this architecture. The figures below depict the system architecture:

Figure 2.12.1 Architecture Hierarchical Crossbar

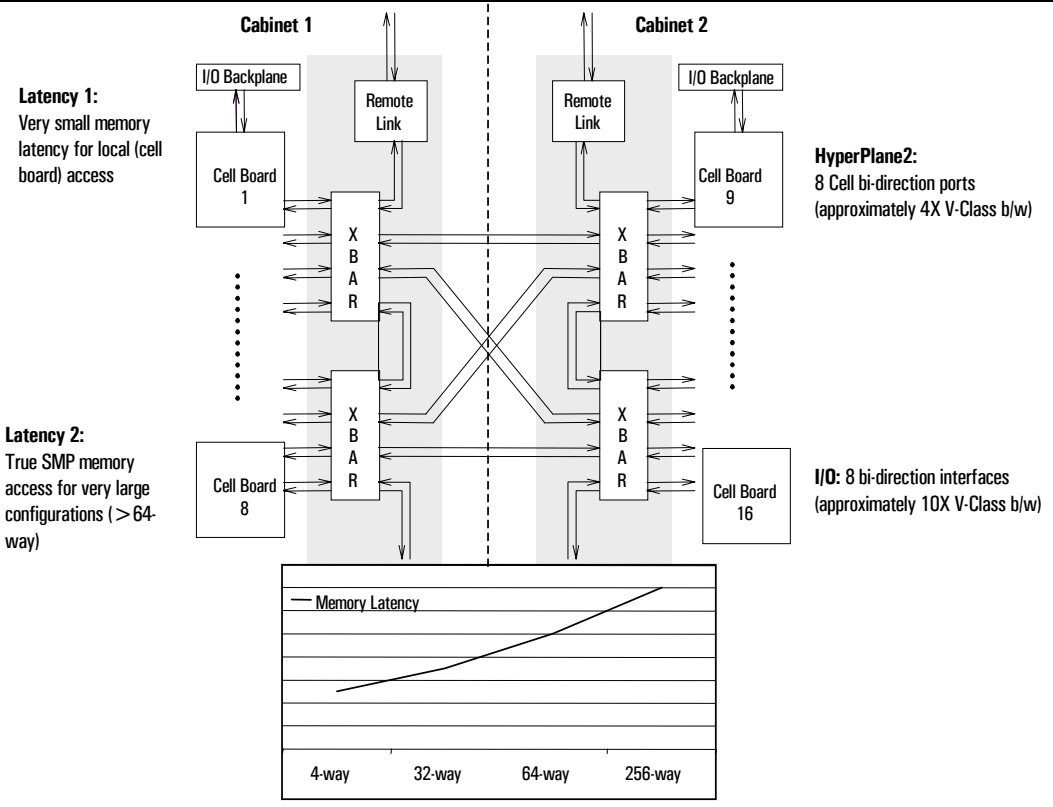
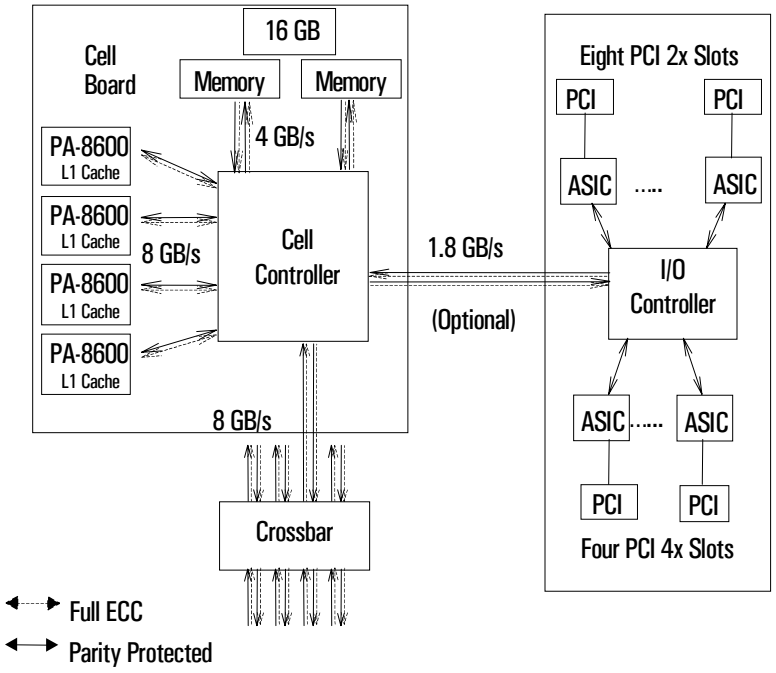


Figure 2.12.2 Cell Board Architecture



Cabinets

A Superdome system will consist of up to four different types of cabinet assemblies:

- At least one Superdome left cabinet. The Superdome cabinets contain all of the processors, memory and core devices of the system. They will also house most (usually all) of the system's PCI cards. Systems may include both left (32-way or 16-way) and right (32-way) cabinet assemblies containing, a left or right backplane respectively.
- One or more HP Rack System/E cabinets. These 19-inch rack cabinets are used to hold the system peripheral devices such as disk drives.
- Optionally, one or more I/O expansion cabinets (Rack System/E). An I/O expansion cabinet is required when a customer requires more PCI cards than can be accommodated in their Superdome cabinets.

Superdome cabinets will be serviced from the front and rear of the cabinet only. This will enable customers to arrange the cabinets of their Superdome system in the traditional row fashion found in most computer rooms. The width of the cabinet will accommodate moving it through common doorways in the U.S. and Europe. The intake air to the main (cell) card cage will be filtered. This filter will be removable for cleaning/replacement while the system is fully operational.

A status display will be located on the outside of the front and rear doors of each cabinet. The customer and field engineers can therefore determine basic status of each cabinet without opening any cabinet doors.

Superdome 16-way and Superdome 32-way systems are available in single cabinet. Superdome 64-way systems are available in dual cabinets. Each cabinet may contain a specific number of cell boards (consisting of CPUs and memory) and I/O. See the following sections for configuration rules pertaining to each cabinet. The base configuration product numbers for each of the models are as follows:

Cells (CPUs and Memory)

A cell, or cell board, is the basic building block of a Superdome system. It is a symmetric multi-processor (SMP), containing up to four active processors and up to 16 GB of main memory using 512-Mbit SDRAM DIMMs. A connection to a 12-slot PCI card cage is optional for each cell.

A cell board contains:

- processors (up to four active, minimum one active)
- memory (up to 16-GB RAM in 2-GB increments with 512-Mbit DRAMs)
- one Cell Controller (CC)
- power converters
- data busses

Superdome 16-way supports one through four cell boards (one through 16 PA-8600 or PA-8700 CPUs and 2- through 64-GB memory). Superdome 32-way supports one through eight cell boards (one through 32 PA-8600 or PA-8700 CPUs and 2- through 128-GB memory). Superdome 64-way supports eight through 16 cell boards (eight through 64 PA-8600 or PA-8700 CPUs and 16- through 256-GB memory).

The minimum configuration includes one active CPU and 2 GB memory per cell board. The maximum configuration includes four active CPU and 16 GB memory per cell board. Each cell board ships with four CPUs. However, based on the number of active CPUs ordered, from one through four CPUs are activated prior to shipment.

Crossbar Backplane

Each Crossbar backplane contains two sets of two crossbar chips that provide a non-blocking connection between eight cells and their associated memory and I/O. For a Superdome 32-way, the backplane supports up to eight cells or 32 processors. For a Superdome 64-way, two backplanes can be linked together with a flex cable to produce a cabinet that can support up to 16 cells or 64 processors. For a Superdome 16-way, the backplane supports up to four cells or 16 processors.

I/O Subsystem

Each I/O chassis provides twelve PCI slots; eight 2x and four 4x PCI slots.

Each Superdome cabinet supports a maximum of four I/O chassis. The optional I/O expansion cabinet can support three I/O chassis enclosures (ICE), each of which supports two I/O chassis for a maximum of six I/O chassis per I/O expansion cabinet.

Each I/O chassis connects to one cell board and the number of I/O chassis supported is dependent on the number of cells present in the system.

The Superdome 16-way system supports a maximum of four cell boards and four I/O chassis for a maximum of 48 PCI slots.

The Superdome 32-way system supports a maximum of eight cell boards and eight I/O chassis for a maximum of 96 PCI slots. Since a single Superdome cabinet only supports four I/O chassis, an I/O expansion cabinet and two I/O chassis enclosures are required to support all eight I/O chassis.

The Superdome 64-way system supports a maximum of 16 cell boards and 16 I/O chassis for a maximum of 192 PCI slots. Since two Superdome cabinets (left and right) only support eight I/O chassis, two I/O expansion cabinets and four I/O chassis enclosures are required to support all 16 I/O chassis. The four I/O chassis enclosures are spread across the two I/O expansion cabinets, either three ICE in one I/O expansion cabinet and one ICE in the other, or two ICE in each.

Superdome's core I/O provides the base set of I/O functions required by every Superdome partition. Each partition must have at least one core I/O card in order to boot. Multiple core I/O cards may be present within a partition (one core I/O card is supported per I/O backplane); however, only one may be active at a time. Core I/O will utilize the standard long card PCI form factor but will add a second card cage connection to the I/O backplane for additional non-PCI signals (USB and utilities). This secondary connector will not impede the ability to support standard PCI cards in the core slot when a core I/O card is not installed.

The core I/O card's primary functions are:
- Partitions (console support) including USB and RS-232 connections
- 10/100Base-T LAN (general purpose)

Other common functions, such as Ultra/Ultra2 SCSI, Fibre Channel, and Gigabit Ethernet, are not included on the core I/O card. These functions are, of course, supported as normal PCI add-in cards.

The unified 100Base-T Core LAN driver code searches to verify whether there is a cable connection on an RJ-45 port or on an AUI port. If no cable connection is found on the RJ-45 port, there is a busy wait pause of 150 ms when checking for an AUI connection. By installing the loopback connector (description below) in the RJ-45 port, the driver would think an RJ-45 cable was connected and would not continue to search for an AUI connection, hence eliminate the 150 ms busy wait state:

Product/Option Number	Description
A7108A	RJ-45 Loopback Connector
0D1	Factory-integration RJ-45 Loopback Connector

Any I/O module can support a Core I/O card, and a Core I/O card is required for each independent partition. A system configured with 16 cells, each with its own I/O module and core I/O card could support up to 16 independent partitions. Note that cells can be configured without I/O modules attached, but I/O modules cannot be configured in the system unless attached to a cell.

The list of supported I/O cards is listed below. Please note that if product number A5207A is ordered, one set of I/O and Networking paper documentation will be received. If A5207A is not ordered, no paper documentation will be received. The I/O and Networking documentation will always be available on a CD. The AVN option is no longer available with Superdome Enterprise Servers.

Table 2.12.3 Supported I/O Cards

Supported		Future Release	Not Supported
• Fast/Wide SCSI (dual port) • Ultra-2 SCSI • Fibre Channel Mass Storage–Tachlite • 1000Base-SX • 1000Base-T • 10/100Base-TX (RJ-45) • 10/100Base-TX (AUI, BNC, RJ-45) • HyperFabric (PCI 4X) copper • PCI HyperFabric2 fiber adapter (PCI 4X) • ATM 155 (MMF) • ATM 622 (MMF) • ATM 155 (UTP5)	• Token Ring LAN (4/16/100 Mb/s) • X.25 (PSI dual port) • X.25 (quad-port) • FDDI Dual Attach • Fast/Wide SCSI • Hippi • PKC (Public Key Cryptography) • PCI 8-port serial MUX adapter • PCI 64-port serial MUX adapter • PCI 2-Gb Fibre Channel adapter (12/1/01 – see Notes) • Dual-port Ultra-2 SCSI + Dual-port 100Base-T (combo card) • 10/100Base-TX (quad-port)	• ACC (8-port) • ACC (quad-port) E1/T1	• 100Base-FX • Fibre Channel Mass Storage–Tachyon • Token Ring (4/16 Mb/s) • HyperFabric (PCI 1X) • FDDI

Notes:

- Change in Superdome SCSI Strategy: As of May 1, 2002, the SCSI approach for Superdome has changed. This will enable use of the Ultra 160 devices available in the future on Superdome. All previously shipped configurations are still supported and do not need any conversion.
- All future shipments of SCSI devices for superdome except HVD10 and SC10 will now be supported with standard cables and auto termination enabled. Only the Surestore Disk System HVD10 (A5616AZ) and the Surestore Disk System SC10 (A5272AZ) will continue to use disabled auto termination and In Line Terminator cables on new orders.
- All future shipments of SCSI cards for Superdome will now use enabled auto termination and standard SCSI cables. The A4800A card doesn't have auto-termination and instead uses an internal terminator 1252-6520 to permit use of standard cable. No external terminator will be needed on any of the SCSI cards for boot without attached cable. New configurations should use the enabled auto termination and standard cables.
- Each A5159A (dual-port FWD) card that supports a Surestore Disk System HVD10 (A5616AZ) will need quantity two (2) of product number C7528A (terminator), otherwise it must have a terminated cable in place on each unterminated port prior to HP-UX boot.
- Each A5838A Dual-port Ultra2 SCSI+Dual-port 100Base-T card that supports a Surestore Disk System SC10 (A5272AZ) will need quantity two (2) of product number C2370A (terminator); otherwise it must have a terminated cable in place prior to HP-UX boot.
- MUXs cannot be placed in 4x slots because they are currently 5 volts only.
- The A6795A PCI 2-Gb Fibre Channel adapter is available with factory-integrated option

External Mass Storage

The list of supported mass storage is as follows:

Table 2.12.4 Supported Mass Storage Products

Mass Storage Array	Mass Storage Enclosure	Mass Storage Single Spindle Disk	Mass Storage Optical Jukebox	Mass Storage Tape Library	Mass Storage Tape Device	Mass Storage CD-ROM
• VA7100 • VA7400 • NAS VA 15 • NAS VA 30 • NAS VA 105 • XP256 • XP256+ (A5700) • XP512 • EMC 3730 • EMC 3700 • EMC 3500 • EMC 3430 • EMC 3400 • EMC 3330 • EMC 3300 • EMC 3230 • EMC 3200 • EMC 3130 • EMC 3100 • Model 30** • Icicle Kicker** • Surestore Disk Array FC60** (A5277AZ)*	• Surestore Disk System 2300 (A6490AZ) • Surestore Disk System 2405 (A6250AZ) • High Availability Storage System (A3312AZ)** (Use DS2300 instead) • Surestore Disk System HVD10 (A5616AZ) • Surestore Disk System FC10 (A5236AZ)** (Use DS2405 instead) • Surestore Disk System SC10 (A5272AZ)** (Use DS2300 instead) • Surestore Disk System 2100 (A5675AZ)	• > =2-GB 7200 SCSI Disks • 10,000 RPM SCSI Disks • 7,200 RPM FC Disks • 10,000 RPM FC Disks	• 660ex 4 drives • 660x 6 drives • 1200ex 10 drives • 1200ex 4 drives • 5200ex drive • 160ex 2 drives • 320ex 4 drives • 400ex 2 drives	• STK 9490 • STK SD-3 • DLT Library 10/560, 6/100, 3/30 • DLT Library 2/15	• DDS-3 Autoloader • DDS-3 • DLT 7000 • IBM 3590 • STK Eagle • LTO	• DVD-RAM • DVD-ROM • 32X • 12X • 4X • 2X

* The FC60 is not currently supported in HA environments as boot devices

** Not for new solutions

For customers ordering a Superdome without a boot disk, they must then supply one at their site. Support services are necessary to install or attach customer provided storage to the Superdome. Customer must order the following two products, H9907A and H9910A (see **Chapter 10** of this guide for further details.)

The list of supported mass storage infrastructure, boot paths and boot devices are as follows:

Table 2.12.5 Supported Mass Storage Infrastructure, Boot Paths, and Boot Devices

Mass Storage Infrastructure	Boot Paths	Boot Devices
• FC Hub 1X and 2X • FC/SCSI MUX • FC Switch 1X and 2X • SE/HVD/LVD SCSI Converter • SE/HVD SCSI Converter	• Fibre Channel 2X • PCI 1-Gb Fibre Channel Adapter • PCI 2-Gb Fibre Channel Adapter (as of mid-2002) • Fast/Wide SCSI • Ultra SCSI • Ultra2 SCSI • 100Base-TX • 10Base-TX • Combo dual-port Ultra2 SCSI + dual-port 10/100Base-T (A5838A)	• CD-ROM • DVD-ROM • DDS Tape • DLT Tape • IBM 3590 • STK Eagle • LTO • All supported SCSI disk arrays • All supported FC disk arrays • All supported single spindle disks • All supported Surestore Disk Systems

The list of I/O cards that are specifically supported for connection to boot and removable media devices are as follows:

Table 2.12.6 Supported I/O Cards

Device	I/O Card	SCSI or FC Boot
DVD-ROM	A6828A Ultra160 SCSI or A6829A Dual-channel Ultra160 SCSI A5838A Dual 100Base-TX + Dual Ultra2 SCSI	SCSI
Surestore Disk System 2100	A6828A Ultra160 SCSI or A6829A Dual-channel Ultra160 SCSI A5838A Dual 100Base-TX + Dual Ultra2 SCSI	SCSI
Surestore Disk System SC10 [1]	A6828A Ultra160 SCSI or A6829A Dual-channel Ultra160 SCSI A5838A Dual 100Base-TX + Dual Ultra2 SCSI	SCSI
Surestore Disk System 2300	A6828A Ultra160 SCSI or A6829A Dual-channel Ultra160 SCSI A5838A Dual 100Base-TX + Dual Ultra2 SCSI	SCSI
Surestore Disk Array XP256 [1]	A4800A Fast/Wide SCSI A5159A Fast/Wide SCSI (dual-port)	SCSI
Surestore Disk Array XP512	A4800A Fast/Wide SCSI A5159A Fast/Wide SCSI (dual-port)	SCSI
EMC Arrays*	A4800A Fast/Wide SCSI A5159A Fast/Wide SCSI (dual-port)	SCSI
High Availability Storage System [1]	A4800A Fast/Wide SCSI A5159A Fast/Wide SCSI (dual-port)	SCSI
Surestore Disk Array 12H [1]	A4800A Fast/Wide SCSI A5159A Fast/Wide SCSI (dual-port)	SCSI
Surestore Disk System HVD10	A4800A Fast/Wide SCSI A5159A Fast/Wide SCSI (dual-port)	SCSI
Surestore Disk System 2405 [2]	Fibre Channel Mass Storage Tachlite	FC
VA7100	Fibre Channel Mass Storage Tachlite	FC
VA7400	Fibre Channel Mass Storage Tachlite	FC
NAS VA 15	Fibre Channel Mass Storage Tachlite	FC
NAS VA 30	Fibre Channel Mass Storage Tachlite	FC
NAS VA 105	Fibre Channel Mass Storage Tachlite	FC
Surestore Disk System FC10	Fibre Channel Mass Storage Tachlite	FC
Surestore Disk Array FC60	Fibre Channel Mass Storage Tachlite	FC
Surestore Disk Array XP256	Fibre Channel Mass Storage Tachlite	FC
Surestore Disk Array XP512	Fibre Channel Mass Storage Tachlite	FC
EMC Arrays	Fibre Channel Mass Storage Tachlite	FC

[1] Not preferred for new solutions.

[2] There are limitations in using the 2G FC in direct attach mode with the DS2405. The customer will only be able to boot in 1G mode with this device.

The DVD solution for Superdome requires the following components per partition. A shared DVD solution that allows all partitions to use only one DVD will be supported in the future. External racks A4901A and A4902A must also be ordered with the DVD solution.

Table 2.12.7 Superdome DVD Solutions

Description	Part Number	Option Number
PCI Ultra160 SCSI Adapter or PCI Dual-channel Ultra160 SCSI Adapter	A6828A or A6829A	0D1
Surestore Tape Array 5300	C7508AZ	
DVD (one per partition)	C7499A	0D1
DDS-4 (opt.)/DAT40	C7497A	0D1
Jumper SCSI Cable for DDS-4 (optional) [1]	C2978B	0D1
SCSI Cable [2,3]	C2363B [2]	0D1
SCSI Terminator	C2364A	0D1

[1] 0.5-meter HD-HDTS68 is required if DDS-4 is used.

[2] 5-meter multi-mode VH-HD68TS available now (C2365B #0D1) and can be used in place of the 10-meter cable on solutions that will be physically compact

[3] 10-meter multi-mode VH-HD68TS available now (C2363B, #0D1)

Table 2.12.8 Superdome SCSI Summary

	JBOD Devices				DVD Devices	
	HVD10	**SC10**	**DS2100**	**DS2300**	**TA5300**	**Smart Storage**
Product Designators	A5616AZ Code: Decepticon CPL/Configurator: Surestore HVD10	A5272AZ Code: Megatron CPL/Configurator: Surestore Disk System SC10	A5675AZ Code: Peak-a-Boo CPL/Configurator: Surestore Disk System 2100	A6490AZ Code: Smuggler CPL/Configurator: Surestore Disk System 2300	C7499A Code: Kwolek CPL/Configurator: Tape Array 5300 Chassis Device	DVD Code: Highlander CPL/Configurator: Smart Storage
Availability or Obsolescence Date	Current; 8/02 replaced by LVD and FC devices	Current; 6/02 replaced by DS2300	Current	Current	Current	Replaced by DVD in TA5300
Description	• HDTS68 connectors • 3.5 EIA • 10 disk storage device	• HDTS68 connectors • 3.5 EIA • 10 disk storage device	• HDTS68 connectors • 1 EIA disk storage system capable of holding up to four disk drives	• VHTS68 connectors • 3 EIA disk storage system capable of holding 15 disk drives	• HDTS68 connectors • TA5300 device • 3 EIA • In TA5300/ C7508AZ order C7499A option 0D1 • Occupies one of four available half-height device locations	• In C4318SZ chassis
Additional Configuration Data	• Dual controller cards • Split bus addressing information library HVD10	• Dual controller cards • Split bus addressing information library SC10	• Single bus information library DS2100	• Split bus information library DS2300	• Daisy chainable with bus length constraint of 12 meters	• Uses an HVD interface to an HVD-to-SE SCSI converter
Bus	HVD	LVD	LVD	LVD	LVD	HVD/SE
Boot Device	Supported	Supported	Supported	Supported	Supported	Supported
Connectivity	• Multi-initiator	• Multi-initiator	• Multi-initiator with 5-meter cables only	• Single initiator only on Ultra 160	• Single initiator • Not daisy chainable for bus lengths greater than 12 meters	
Operating System	11i	11.i	11.i	11.i	11.i	11.i
HBA [1, 2]						
A4800A FY03	S48 non-ILT cable (not applicable); ILT48 ILT cable boot	Not supported	Not supported	Not supported	Not supported	D48 boot
A5159A	E59 (not applicable); D59 boot	Not supported	Not supported	Not supported	Not supported	D59 boot
A5838A	Not supported	D38 boot	D38 boot; E38 boot	E38 boot	D38 boot; E38 boot	Not supported
A6828A (available 7/02)	Not supported	E28 boot	E28 boot	E28 boot	E28 boot	Not supported
A6829A (available 7/02)	Not supported	E29 boot	E29 boot	E29 boot	E29 boot	Not supported
A5658A	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported

[1] Not applicable from a new solution perspective

[2] D = auto-termination disabled; E = auto-termination enabled, S = standard cable

Table 2.12.8 Superdome SCSI Summary (continued)

	DAT Devices			DLT Devices		
	DAT40	**DAT24**	**DAT40**	**DLT80**	**DLT80**	**DLTVS80**
Product Designators	DDS-4 C7497A Code: Kwolek CPL/Configurator: Tape Array 5300 Chassis Device	DDS-3 C7498A Code: Kwolek CPL/Configurator: Tape Array 5300 Chassis Device	DDS-3 Code: Highlander CPL/Configurator: Smart Storage	C7456A Code: Kwolek CPL/Configurator: Tape Array 5300 Chassis Device	C7456A Code: Einstein CPL/Configurator: Tape Array 5500 Chassis Device	C7507A Code: Kwolek CPL/Configurator: Tape Array 5300 Chassis Device
Availability or Obsolescence Date	Current	Current	Replaced by TA5300 chassis product	Current	Current	Current
Description	• HDTS68 connectors • TA5300 device • 3 EIA • 2 full-height or 4 half-height devices • In TA5300/ C7508AZ order C7497A option 0D1 • Occupies one of four available half-height device locations	• HDTS68 connectors • TA5300/ C7508AZ order C7498A option 0D1 • Occupies one of four available half-height device locations	• In C4318SZ chassis	• HDTS68 connectors • TA5300/ C7508AZ order C7456A option 0D1 • Occupies two of four available half-height device locations	• HDTS68 connectors • TA5500/ C1354AZ order C7456A option 0D1 • Occupies one of five available full-height device locations	• HDTS68 connectors • TA5300/ C7508AZ order C7507A option 0D1 • Occupies one of four available half-height device locations
Additional Configuration Data	• Daisy chainable with bus length constraint of 12 meters	• Daisy chainable with bus length constraint of 12 meters Note: When daisy chained, the entire bus will run at lower speed	• Uses an HVD interface to an HVD to SE SCSI converter	• Daisy chainable with bus length constraint of 12 meters	• Daisy chainable with bus length constraint of 12 meters	•
Bus	LVD	SE		LVD	LVD	LVD
Boot Device	Supported	Supported	Supported	Supported	Supported	Not supported
Connectivity	• Single initiator • Not daisy chainable for bus lengths greater than 12 meters	• Single initiator • Not daisy chainable for bus lengths greater than 12 meters		• Single initiator • Not daisy chainable for bus lengths greater than 12 meters	• Single initiator • Not daisy chainable for bus lengths greater than 12 meters	• Single initiator • Not daisy chainable for bus lengths greater than 12 meters
Operating System	11.i	11.i	11.i	11.i	11.i	11.i
HBA [1, 2]						
A4800A FY03	Not supported	Not supported	D48 boot	Not supported	Not supported	Not supported
A5159A	Not supported	Not supported	D59 boot	Not supported	Not supported	Not supported
A5838A	D38 boot; E38 boot	D38 boot; E38 boot	Not supported	E38 boot	E38 boot	E38 boot
A6828A (available 7/02)	E28 boot	E28 boot	Not supported	E28 boot	E28 boot	E28 boot
A6829A (available 7/02)	E29 boot	E29 boot	Not supported	E28 boot	E29 boot	E29 boot
A5658A	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported

[1] Not applicable from a new solution perspective

[2] D = auto-termination disabled; E = auto-termination enabled, S = standard cable

Table 2.12.8 Superdome SCSI Summary (continued)

	DLT Devices (continued)					
	Autoload	**Autoload**	**Midrange Library**	**Midrange Library**	**High-end Library**	**High-end Library**
Product Designators	LVD family	HVD family	LVD family	HVD family	LVD family	HVD family
Availability or Obsolescence Date	Current	Current	Current	Current	Current	Current
Description	• HDTS68 connectors	• HDTS68 connectors	• HDTS68 connectors	• HDTS68 connectors	• HDTS68 connectors	• HDTS68 connectors
Additional Configuration Data						
Bus	LVD	HVD	LVD	HVD	LVD	HVD
Boot Device	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported
Connectivity						
Operating System	11.i	11.i	11.i	11.i	11.i	11.i
HBA [1, 2]						
A4800A FY03	Not supported	S48 boot	Not supported	S48 boot	Not supported	S48 boot
A5159A	Not supported	E59 boot	Not supported	E59 boot	Not supported	E59 boot
A5838A	E38 boot	Not supported	E38 boot	Not supported	E38 boot	Not supported
A6828A (available 7/02)	E28 boot	Not supported	E28 boot	Not supported	E28 boot	Not supported
A6829A (available 7/02)	D29 boot	Not supported	D29 boot	Not supported	D29 boot	Not supported
A5658A	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported

[1] Not applicable from a new solution perspective
[2] D = auto-termination disabled; E = auto-termination enabled, S = standard cable

Table 2.12.8 Superdome SCSI Summary (continued)

	Ultrium Devices					
	Autoload	**Autoload**	**Midrange Library**	**Midrange Library**	**High-end Library**	**High-end Library**
Product Designators	LVD family	HVD family	LVD family	HVD family	LVD family	HVD family
Availability or Obsolescence Date	Current	Current	Current	Current	Current	Current
Description	• HDTS68 connectors	• HDTS68 connectors	• HDTS68 connectors	• HDTS68 connectors	• HDTS68 connectors	• HDTS68 connectors
Additional Configuration Data						
Bus	LVD	HVD	LVD	HVD	LVD	HVD
Boot Device	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported
Connectivity						
Operating System	11.i	11.i	11.i	11.i	11.i	11.i
HBA [1, 2]						
A4800A FY03	Not supported	S48 boot	Not supported	S48 boot	Not supported	S48 boot
A5159A	Not supported	E59 boot	Not supported	E59 boot	Not supported	E59 boot
A5838A	E38 boot	Not supported	E38 boot	Not supported	E38 boot	Not supported
A6828A (available 7/02)	E28 boot	Not supported	E28 boot	Not supported	E28 boot	Not supported
A6829A (available 7/02)	D29 boot	Not supported	D29 boot	Not supported	D29 boot	Not supported
A5658A	Not supported	Not supported	Not supported	Not supported	Not supported	Not supported

[1] Not applicable from a new solution perspective
[2] D = auto-termination disabled; E = auto-termination enabled, S = standard cable

Table 2.12.8 Superdome SCSI Summary (continued)

	Ultrium Devices (continued)			Optical Devices	
	230	**230**	**215**	**Jukebox**	**Jukebox**
Product Designators	C7470A	C7470A	C7492A	LVD family	HVD family
Availability or Obsolescence Date	Current	Current	Current	Current	Current
Description	• HDTS68 connectors • In TA5500 • Two half-height	• HDTS68 connectors • In TA5300 • Two half-height	• HDTS68 connectors • In TA5300 • Two half-height	• HDTS68 connectors	• HDTS68 connectors
Additional Configuration Data	• Single initiator • Not daisy chainable for bus lengths greater than 12 meters	• Single initiator • Not daisy chainable for bus lengths greater than 12 meters	• Single initiator • Not daisy chainable for bus lengths greater than 12 meters		
Bus	LVD	LVD	LVD	LVD	HVD
Boot Device	Supported	Supported	Supported	Not supported	Not supported
Connectivity					
Operating System	11.i	11.i	11.i	11.i	11.i
HBA [1, 2]					
A4800A FY03	Not supported	Not supported	Not supported	Not supported	S48 boot
A5159A	Not supported	Not supported	Not supported	Not supported	E59 boot
A5838A	E38 boot	E38 boot	E38 boot	E38 boot	Not supported
A6828A (available 7/02)	E28 boot	E28 boot	E28 boot	E28 boot	Not supported
A6829A (available 7/02)	D29 boot	D29 boot	D29 boot	D29 boot	Not supported
A5658A	Not supported	Not supported	Not supported	Not supported	Not supported

[1] Not applicable from a new solution perspective

[2] D = auto-termination disabled; E = auto-termination enabled, S = standard cable

Information Library

- SCSI Home Page: http://hpncdrg.cup.hp.com/
  See Manuals and Standards, and SCSI Product Matrix
- SPOC: http://turbo.rose.hp.com/spock/index.shtml
- DS2100: http://www.hp.com/products1/storage/products/disk_arrays/disksystems/ds2100/index.html
- DS2300: http://www.hp.com/products1/storage/products/disk_arrays/disksystems/ds2300/index.html
- HVD10: http://www.hp.com/products1/storage/products/disk_arrays/disksystems/hvd10/index.html
- SC10: http://www.hp.com/products1/storage/products/disk_arrays/disksystems/sc10/index.html
- TA5300: http://www.hp.com/products1/storage/products/tapebackup/tapearrays/tapearray5300/index.html
- TA5500: http://www.hp.com/products1/storage/products/tapebackup/tapearrays/tapearray5500/index.html
- Tape Library: http://www.hp.com/products1/storage/products/automatedbackup/autoloaders/index.html

Partitions

A partition consists of one or more cells that communicate coherently over a high bandwidth, low latency crossbar fabric. Individual processors on a single cell board cannot be separately partitioned. Cells are grouped into physical structures called cabinets or nodes. Special programmable hardware in the cells defines the boundaries of a partition in such a way that the isolation is enforced from the actions of other partitions.

Each partition runs its own independent operating system. Different partitions may be executing the same or different revisions of an operating system, or they may be executing different operating systems altogether (such as HP-UX and Windows 2000). Linux and Windows 2000 support will only be available in Superdome IA-64 system (not at first release).

Each partition has its own independent CPUs, memory and I/O resources consisting of the resources of the cells that make up the partition. Resources may be removed from one partition and added to another without having to physically manipulate the hardware just by using commands that are part of the System Management interface.

At first release, Superdome/HP-UX 11i supports static partitions. Static partitions imply that any partition configuration change requires a reboot of the partition. In a future HP-UX release, dynamic partitions will be supported. Dynamic partitions imply that partition configuration changes do not require a reboot of the partition. Using the related capabilities of dynamic reconfiguration (i.e. on-line addition, on-line removal), new resources may be added to a partition and failed modules may be removed and replaced while the partition continues in operation.

Reliability/Availability Features

Superdome 's high availability offering at first release is as follows:

- On-line Addition/Replacement (OLAR) for I/O backplane, individual I/O cards, some external peripherals, SUB/HUB. OLAR for cells will be available in a follow-on HP-UX release. Please note that OLAR for individual CPUs and memory DIMMs will never be supported.
- Hot swap redundant fans (main and I/O) and power supplies (main, and backplane power bricks)
- Dual power source
- Some fault tolerance to I/O peripheral errors.
- Parity-protected I/O paths; recovery to a dual I/O path
- Redundant path to system disk
- Multiple partitions with hardware and 100% software isolation between partitions
- Memory ECC (single bit correct/double bit detect, single RAM failure tolerant)
- CPU/Crossbar ECC (single bit error correct for cell to cell communication)
- Phone-Home capability
- Multi-System High Availability (with MC/ServiceGuard and ServiceGuard OPS Edition)

Supportability Features

Console Port (Guardian Service Processor [GSP])

Functional capabilities:

- Local console physical connection (RS-232)
- Display of system status on the console (Front panel display messages)
- Console mirroring between LAN and RS-232 ports
- System hard and soft (TOC or INIT) reset capability from the console.
- Password secured access to the console functionality
- Support of generic terminals (i.e. VT100 compatible).
- Power supply control and monitoring from the console. It will be possible to get power supply status and to switch power on/off from the console.

- Console over the LAN. This means that a PC or HP workstation can become the system console if properly connected on the customer LAN. This feature becomes especially important because of the remote power management capability. The LAN will be implemented on a separate port, distinct from the system LAN, and provide TCP/IP and Telnet access.
- There is one GSP per Superdome cabinet, thus there are two (2) for a 64-way system. But one, and only one, can be active at a time. Also there is no redundancy or failover feature.

Hardware and Software Requirements

The customer may utilize any of the following devices as a Superdome console device. Support for the console must be purchased separately. Support response time and coverage for the console are defined by the support purchased for it.

- an HP Workstation running HP-UX 11.x
- a PC running Windows NT
- a PC running Windows 98
- a PC running Windows 2000
- a PC running Windows NT
- HP Brio (details below)
- C1099A for bring up—limited functionality due to text mode only operation

The device must have a 10Base-T Ethernet connection or an RS-232 port or both.

In addition, the customer must install software capable of providing an X-terminal window for console access on the PC (i.e. Reflection for HP with NS/VT).

- HP Brio BA210 (P1564T) with HP 71 17-inch Color Monitor (D8901A).
- HP Brio BA210 MicroTower (P1565T) featuring Intel's 466-MHz Celeron processor for maximum performance.
- PC also includes 32-MB SDRAM, 4.3-GB Ultra ATA/33 hard disk storage, Intel 3D direct AGP graphics, 40X max-speed CD-ROM, and Windows 98. Keyboard (C4735A) and mouse (C3751B) should also be ordered.
- The HP 71 17-inch color monitor (D8901A) is a flat square monitor (15.9-inch viewable) with 0.28-mm dot pitch, 70-kHz hor. frequency and 1280×1024 at 60 MHz (S7005A).
- Additional 128-MB memory (P1565T) and LAN card (D7508A) are also required.

Support Management Station

The Support Management Station (SMS) runs the Superdome scan tools that enhance the diagnosis and testability of Superdome. The SMS and associated tools also provide for faster and easier upgrades and hardware replacement. The SMS does not come with a display monitor or keyboard because it is not designed for use as a console device.

Only one SMS per customer site (or data center) is required. One SMS can support more than one Superdome platform using a hub. The SMS is connected to each Superdome system on a private LAN. Physically, it would be beneficial to have the SMS close to the Superdome system because the Customer Engineer (CE) will run the scan tools and would need to be near the Superdome system to replace failing hardware. The physical connection from Superdome is a private Ethernet connection and thus, the absolute maximum distance is determined by the Ethernet specification.

The SMS can support two LAN interfaces: one the dedicated connection to the systems to be supported, and the second one to interface with the customers' general LAN. These two LAN connections allow SMS operations to be performed remotely.

Functional Capabilities

The SMS basic functional capabilities are:

- Allow remote access via customer LAN (no modem access).
- Ability to be disconnected from the Superdome platform(s) and not disrupt their operation.
- Ability to connect a new Superdome platform to the SMS and be recognized by scan software.
- Ability to support multiple, heterogeneous Superdome platforms (scan software capability).
- Ability to scan one Superdome platform while other Superdome platforms are connected (and not disrupt the operational platforms).
- Ability to run the scan software tools.
- Ability to run up to 4 scan processes concurrently (each on a different Superdome platform).
- Support for utility firmware update.

Physical Connection

The SMS has two RJ-45 (10/100Base-T) connections—one RJ-45 connection is the minimum requirement for scan. Note the connection on the Superdome platform is a RJ-45 connection to the Private LAN Port.

For connecting the first Superdome platform to the SMS, the 25-foot crossover cable C7538A is provided with the SMS.

For connecting more than one Superdome platforms to the SMS (up to sixteen maximum), a LAN hub is required for the RJ-45 connection. A point-to-point connection only (cross over LAN cable required if no hub) is required for one Superdome platform to one SMS.

***Note**: Cabling for these configurations are left up to the Customer and Customer Engineer and should be considered as detailed in the site preparation guide at time of site preparation. LAN cables are not included with the SMS. A combination of standard 10/100Base-T cables or cross over 10/100Base-T cables will be required depending on the choice of use of hubs and distance required at site.*

Hardware Requirements

The SMS should contain the following minimum hardware requirements:

- One A500 server or equivalent
- Two LAN connections (one private LAN for SCAN and one public LAN) running at 10/100Base-T (RJ-45)
- One 18-GB Disk capacity
- A minimum of 256-MB ECC memory
- One external CD (or DVD) ROM
- One serial port (for possible local terminal connection)
- One external DDS drive (for utility firmware downloads and as a backup device)
- One add-on LAN card (implements required second LAN connection)
- A 25-foot crossover cable is provided with each SMS. It can be used if only one Superdome server is connected to the SMS. If more than one Superdome is connected to the SMS, the crossover cable is no longer appropriate. The Ethernet Crossover Cable (see table below) must be ordered.

In order to ensure connectivity to all Superdome systems at a site, one of the following is recommended:

Description	Product Number	Quantity
12-port hub with straight through RJ-45 cables	J3294A	1
24-port hub with straight through RD-45 cables	J3295A	1

Table 2.12.9 Product Numbers for Support Management Station

***Note**: Order **either** field-rack kit **or** factory integration.*

Description	Product Number	Option	Quantity
HP 9000 A500 Enterprise Server	A5570B		1
440-MHz PA-RISC 8500 CPU	A5571A	0D1	1
128-MB High Density SyncDRAM memory module	A5572A	0D1	2
18-GB Hot-plug Ultra SCSI Low Profile Disk	A5574A	0D1	1
PCI 10/100Base-TX LAN Adapter, RJ-45 Connector	A5230A	0D1	1
Secure Web Console PCI Card	A5858A	0D1	1
Ethernet Crossover Cable—25-foot CAT 5 M/M	C7538A 5183-2688		1
Factory Integration	A5811A	0D1	0 or 1
Field Rack Kit	A5810A	0D1	0 or 1
HP-UX Server Operating Environment Media for Servers	B3920EA	UM4	1
Localization		ABA	1
Instant Ignition		0D1	1
U.S.–English Localization		ABA	1
CD Media Kit (optional Max. 1)		AAF	1
64-Bit Configuration		ASF	1
HP-UX 11.0 User License	B9088AA		1
HP-UX Version 11.0		AH0	1
Factory Racked Configuration			
Surestore Tape Array 5300	C7508AZ		1
DVD	C7499A	#0D1	1
DDS-4/DAT40	C7497A	#0D1	1
Jumper SCSI Cable for DDS-4 (optional)	C2978B	#0D1	1
1-meter Multi-mode VH-HD68 SCSI Cable	C2361B		1
SCSI Terminator HDTS68 LVD/SE	C2364A		1
Field Racked Configuration			
Surestore Tape Array 5300	C7508A		1
DVD	C7499A		1
DDS-4/DAT40	C7497A		1
Jumper SCSI Cable for DDS-4 (optional)	C2978B		1
1-meter Multi-mode VH-HD68 SCSI Cable	C2361B		1
SCSI Terminator HDTS68 LVD/SE (Note: Option 0D1 is required since the terminator is not structured to an A-Class Server. It connects to the core I/O on the A-Class Server)	C2364A	#0D1	1

SMS Console Requirements

If remote access is not available to the SMS then some sort of local access must be possible either via a keyboard/mouse/monitor or even via a terminal connected to a serial port, for example a VT100 terminal hooked up to an RS-232 port.

A Note About Console Devices

There are three different terminals supported as the console device:

1. Terminal with soft keys and soft key labels (i.e. hpterm)
2. Terminal with function keys, but no labels (i.e. dtterm)
3. Terminal without function keys (i.e. vt100)

The menu interface to the support tools is more user-friendly with an HP terminal or with a terminal that supports function keys.

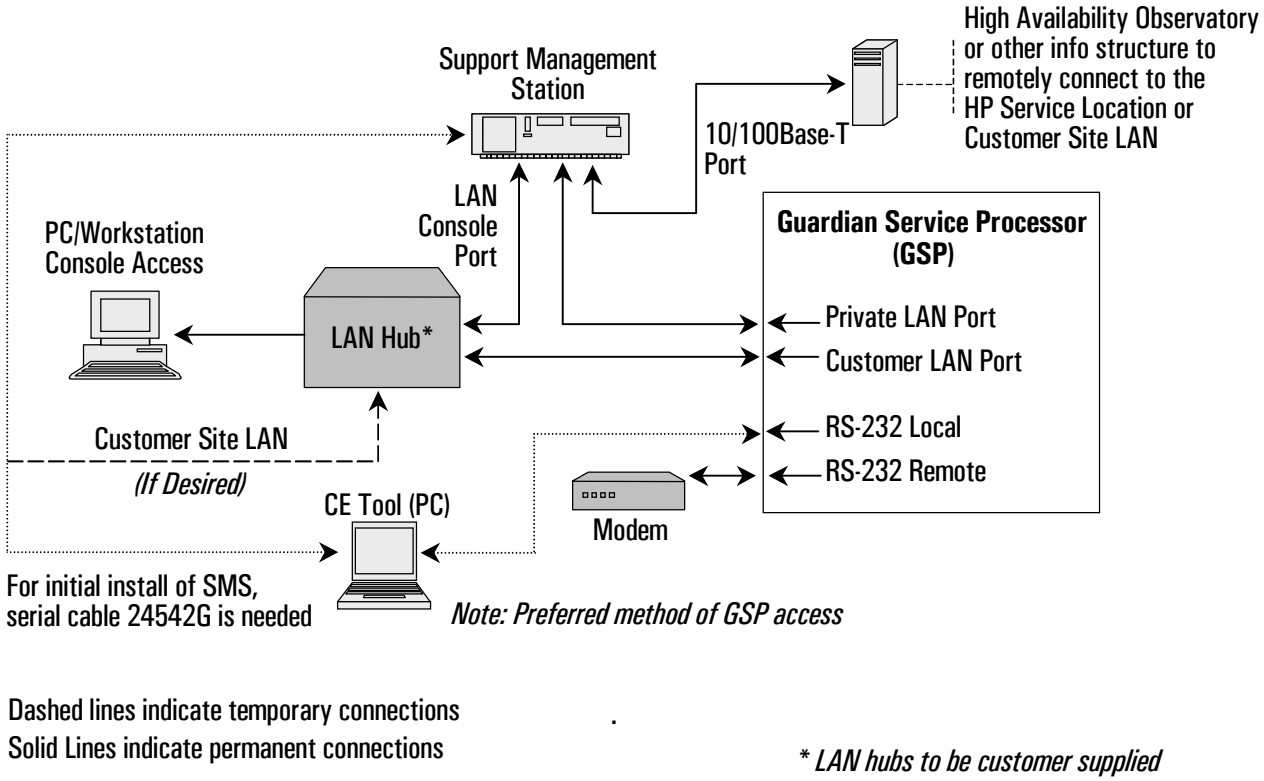
Software Requirements

The SMS must run, at a minimum, HP-UX version 11.0.

Other supportability features include:

- Online diagnostics for Mesa
- Online addition/replacement/deletion of drives
- HP-UX kernel panic reduction
- Support application packaging for Superdome
- Event Notifier for all configurations
- High Availability Observatory for Critical Systems and Business Continuity Configurations

Figure 2.12.3 Guardian Service Processor External Connections


High Availability Observatory or other info structure to remotely connect to the HP Service Location or Customer Site LAN
Support Management Station
10/100Base-T Port
LAN Console Port
PC/Workstation Console Access
Guardian Service Processor (GSP)
LAN Hub*
Private LAN Port
Customer LAN Port
RS-232 Local
RS-232 Remote
Customer Site LAN
(If Desired)
CE Tool (PC)
Modem
For initial install of SMS, serial cable 24542G is needed
Note: Preferred method of GSP access
Dashed lines indicate temporary connections
Solid Lines indicate permanent connections
* LAN hubs to be customer supplied

***Note**: The CE Tool is used by the CE to service the system and is not part of the purchased system.*

Support Application Packaging for Superdome

- Event Notifier for all Configurations
- High Availability Observatory for Critical Systems and Business Continuity Configurations

Event Notifier will be included with all configurations for Superdome. The Mission Critical configurations, Critical Systems, and Business Continuity configurations will also have the advantage of HP's High Availability Observatory (HAO), which supplements the Event Notifier with a variety of proactive tools to help optimize environment uptime. The support application solution will consist of the following components:

Component	Description/Purpose
All Configurations	
HP Support Node	HP-owned and maintained workstation that hosts support applications and provides the entry point for secure remote access into the customer's environment
Cisco Router	HP owned and maintained router that supports ISDN connectivity between HP and the customer's HP Support Node and Superdome systems.
HP Configuration Tracker	Support Node application that collects hardware, software, network configuration data on a nightly basis and identifies what changed in the customer environment.
Event Notifier	HP support application that leverages OpenView Network Node Manager (NNM) to receive real time hardware fault events and transmit this information to the Mission Critical Support Center. HP Support Engineers will be able to review event history through the NNM user interface on the HP Support Node.
MCSC Monitor	HP application used by HP support engineers to review customer current configuration data as well as historical changes. . HP Support engineers will be able to use MCSC Monitor to troubleshoot configuration problems identified by Event Notifier.
Transport Office Manager (TOM)	Support Node application that transmits configuration changes from the customer site to HP. Data is encrypted via RSA technology.
Workflow Management	Workflow cases will be created when fault conditions as detected by Event Notifier are reported to HP and actions are required from an HP Support engineer
Critical Systems and Business Continuity Configurations Only	
Network Node Manager	Polls and stores network topology from the customer's Mission Critical environment.
HA Meter	System availability measurement.
Remote Connectivity	Allows remote access to key configuration data and diagnostic tools at the customer site.
Q4	Tool for analyzing core dump files.
HA-NISP	Network topology transmitted to HP and viewable via Web Nisp Manager.
Configuration Analyzer (proactive analysis)	Systematically analyzes customer configurations for patch, service note and firmware irregularities.

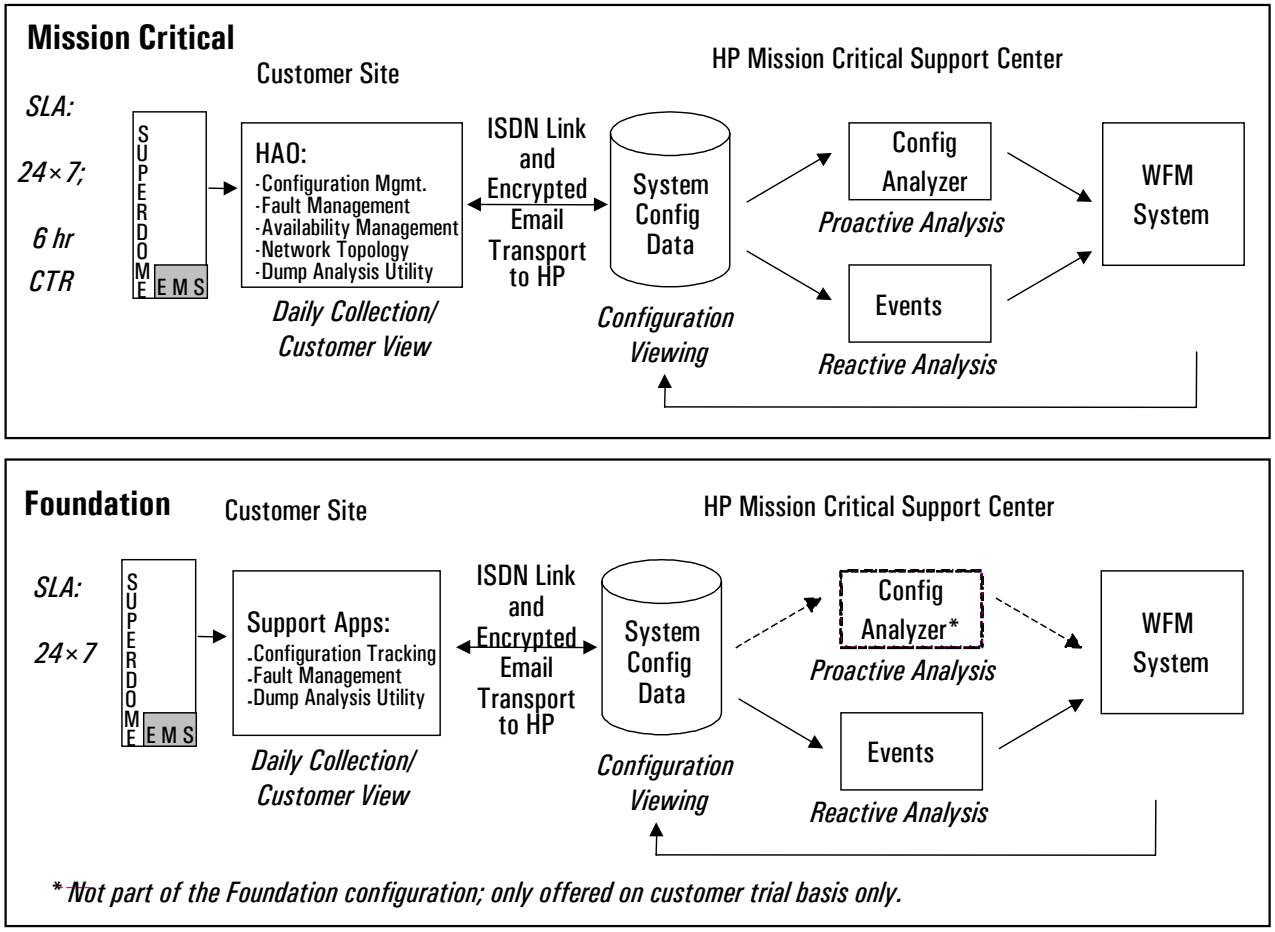
The support application solution for Superdome will work as shown below.

An HP-owned Support Node, consisting of a workstation and network router will reside on the customer's site. This Support Node will collect vital status and configuration information about the system. A secure connection from the HP Support Node to HP's Mission Critical Support Center (MCSC) ensures that this data can only be viewed and securely shared with qualified HP support engineers via the MCSC. System and network information is accessible only to HP support personnel using access, authorization, and authentication technology designed in accordance with industry-leading security standards.

On a nightly basis, configuration information will be collected from the Superdome machines and made available for 1) customer review in the Support Node version of HP Configuration Tracker and, 2) HP Support Engineer review in the MCSC Monitor. Configuration data from both Mission Critical and Foundation customers will be sent to the MCSC Monitor in the appropriate Super-Region. That way, HP support engineers would be able to have fast access to up-to-date configuration information and change history making their troubleshooting and problem resolution efforts more efficient.

The major difference between the MC and Foundation Configuration for Superdome, besides the SLA (Support Level Agreement) terms, is the exclusion of proactive services and analysis, and Network Support applications such as Network Node Manager, HA Meter, and HA-NISP in the Foundation Configuration.

Figure 2.12.4 Support Application Solution for Superdome



System Management Features

Partition Manager

Functional Capabilities
- Displays complex status
- Launch as a GUI from SAM
- Launch directly from command line
- Create and modify partitions
- Display a complete hardware inventory
- Display status of key complex components
- Check for problem or unusual complex conditions
- Manage power to cells and I/O chassis
- Turn on/off attention indicators for cells, I/O chassis, I/O cards and cabinets

ServiceControl

HP's ServiceControl suite provides increased efficiency for systems administrators through truly multi-system management tools. Security, a concern in any IT environment but especially important given the global reach of the Internet, is addressed via the improved security afforded by capabilities such as role-based management and the highest degree of encryption. A big part of administration is rolling out patches, updates, and new versions, as well as keeping track of system usage, licenses, and assets; ServiceControl suite has provision for rapid deployment, and for consistency and asset management. It also includes monitoring tools for keeping the administrator up-to-date on vital operating parameters such as performance, response time, and availability. This all adds up to better control—and better and more profitable e-services. For more information on ServiceControl, please refer to **Subchapter 6.6.**

General Site Preparation Rules

AC Power Requirements

The modular, N+1 power shelf assembly is called the Front End Power Subsystem (FEPS). The redundancy of the FEPS is achieved with 6 internal Bulk Power Supplies (BPS), any five of which can support the load and performance requirements.

Input Options

Reference the Site Preparation Guide for detailed power configuration options.

Table 2.12.10 Input Power Options

PDCA Product Number	Source Type	Source Voltage (nominal)	PDCA Required	Input Current Per Phase 200-240 VAC	Power Required
A5800A Option 001[a]	3-phase	Voltage range 200-240 VAC, phase-to-neutral, 50/60 Hz (EUR typical)[b]	5-wire	24 A Maximum per phase	None required. Electrician must hardware power to the PDCA[c]
A5800A Option 002[a]	3-phase	Voltage range 200-240 VAC, phase-to-phase, 50/60 Hz (US typical)	4-wire	44 A Maximum per phase	None required. Electrician must hard-wire power to the PDCA[c]
A5800A Option 004[d]	3-phase	Voltage range 200-240 VAC, phase-to-phase, 50/60 Hz (US typical)	4-wire	44 A Maximum per phase	In-line connector and plug provided with a 2.5-meter power cable. Electrician must hard-wire in-line connector to 100 A site power.[c,e]
A5800A Option 005[d]	3-phase	Voltage range 200-240 VAC, phase-to-neutral, 50/60 Hz (EUR typical)	5-wire	24 A Maximum per phase	In-line connector and plug provided with a 2.5-meter power cable. Electrician must hard-wire in-line connector to 60 A/63 A site power[c,e,f]
A5800A Option 006[g]	3-phase	Voltage range 200-240 VAC, phase-to-phase, 50/60 Hz	4-wire	44 A Maximum per phase	2.5 meter UL power cord and OL approved plug provided. The customer must provide the mating in-line connector or purchase quantity one A6440A opt 401 to receive a mating in-line connector. An electrician must hardwire the in-line connector to 60 A/63 A site power.[c,f,h]
A5800A Option 007[i]	3-phase	Voltage range 200-240 VAC, phase-to-neutral, 50/60 Hz	5-wire	24 A Maximum per phase	2.5 meter <HAR> power cord and VDE approved plug provided. The customer must provide the mating in-line connector or purchase quantity 1 A6440A opt 501 to receive a mating in-line connector. An electrician must hardwire the in-line connector to 30 A/32 A site power.[c,h,j]

a. Options 1 and 2 have been deleted.
b. 415 VAC phase-to-phase is possible.
c. A dedicated branch is required for each PDCA installed.
d. Options 4 and 5 have been deleted.
e. Refer to **Table 2.12.11** for detailed specifics related to these options.
f. In the U.S.A, site power is 60 Amps; in Europe site power is 63 Amps.
g. Customer must provide in-line connector or purchase A6440A option 401.
h. Refer to **Table 2.12.12** for detailed specifics related to this option.
i. Customer must provide in-line connector or purchase A6440A option 501.
j. In the U.S.A. site power is 30 Amps; in Europe site power is 32 Amps.

Table 2.12.11 Option 004 and 005 Specifics[a]

PDCA Product Number	Attached Power Cord	Attached Plug	Connector Provided
A5800A Option 004	OLFLEX 190 (PN 600404) is a 2.5-meter multi-conductor, 600-volt, 90-degree C, UL and CSA approved, oil resistant flexible cable. (100A capacity)	Mennekes ME 4100P9 (100 A capacity)	Mennekes ME 4100C9 (100 A capacity)
A5800A Option 005	H07RN-F (OLFLEX PN 1600111) is a 2.5-meter heavy-duty neoprene jacketed harmonized European flexible cable. (63A capacity)	Mennekes ME 563P6-1235 (63 A capacity)	Mennekes ME 563C6-1245 (63 A capacity)

a. Options 4 and 5 have been deleted.

Table 2.12.12 Option 006 and 007 Specifics[a]

			Customer-Provided Part	
PDCA Product Number	**Attached Power Cord**	**Attached Plug**	**In-Line Connector**	**Panel-Mount Receptacle**
A5800A Option 006	OLFLEX 190 (PN 600804), four-conductor, 6-AWG (16-mm^2), 600-Volt, 60-Amp, 90-degree C, UL, and CSA approved, conforms to CE directives GN/YW ground wire.	Mennekes ME 460P9 3-phase, 4-wire, 60-Amp, 250-Volt, UL approved. Color blue, IEC 309-1, IEC 309-1, grounded at 3:00 o'clock.	Mennekes ME 460C9 3-phase, 4-wire, 60-amp, 250-Volt, UL approved. Color blue, IEC 309-1, IEC 309-1, grounded at 9:00 o'clock.[a]	Mennekes ME 460R9 3-phase, 4-wire, 60-amp, 250-Volt, UL approved. Color blue, IEC 309-1, IEC 309-1, grounded at 9:00 o'clock.[b]
A5800A Option 007	Five conductors, 10-AWG (6-mm^2), 450/475-Volt, 32-Amp, <HAR> European wire cordage, GN/YW ground wire.	Mennekes ME 532P6-14 3-phase, 5-wire, 32-Amp, 450/475-volt, VDE certified, color red, IEC 309-1, IEC 309-2, grounded at 6:00 o'clock.	Mennekes ME 532C6-16 3-phase, 5-wire, 32-Amp, 450/475-Volt, VDE certified, color red, IEC 309-1, IEC 309-2, grounded at 6:00 o'clock.[c]	Mennekes ME532R6-1276 3-phase, 5-wire, 32-Amp, 450/475-Volt, VDE certified, color red, IEC 309-1, IEC 309-2, grounded at 6:00 o'clock.[b]

a. In-line connector is available from HP by purchasing A6440A, Option 401.

b. Panel-mount receptacles must be purchased by the customer from a local Mennekes supplier.

c. In-line connector is available from HP by purchasing A6440A, Option 501.

***Note**: A qualified electrician must wire the PDCA in-line connector to site power using copper wire and in compliance with all local codes.*

Input Requirements

Reference the Site Preparation Guide for detailed power configuration requirements.

Requirements	Value	Conditions/Comments
Nominal Input Voltage (VAC rms)	200/208/220/230/240	
Input Voltage Range (VAC rms)	200-240	Auto-selecting. Measure at input terminals.
Frequency Range (Hz)	50/60	
Number of Phases	3	3-phase 5-wire with power cord; 3-phase 4-wire with power cord
Maximum Input Current (A rms), 3-Phase 5-wire	20	3 phase source with a source voltage of 220 VAC measured phase to neutral
Maximum Input Current (A rms), 3-Phase 4-wire	40	3 phase source with a source voltage of either 208 VAC or 230 VAC measured phase to phase
Maximum Inrush Current (A peak)	90	
Circuit Breaker Rating (A), 3-Phase 5-wire	25 A	Per phase
Circuit Breaker Rating (A), 3-Phase 4-wire	45 A	Per phase
Power Factor Correction	0.95 minimum	
Ground Leakage Current (mA)	>3.5 mA, with 6 BPSs installed	Warning label applied to the PDCA at the AC Mains input

Cooling Requirements

- The cooling system in Superdome was designed to maintain reliable operation of the system in the specified environment as shown in ***Table 2.12.1***. In addition, the system is designed to provide a redundant cooling (i.e. N+1 fans and blowers) that allows all of the cooling components to be "hot swapped." The typical power dissipation for the PA-8600 is 28,850 BTUs/hour for a fully populated 32-way cabinet. For PA-8700, the typical power dissipation is approximately 23,660 BTUs/hour for a fully populated 32-way cabinet. ***Note****: For other configurations see "Site Prep Guide 6th Edition", Table 5. For maximum power dissipation, see* ***Table 2.12.1*** *above under Site Preparation.*
- Superdome was designed to operate in all data center environments with any traditional room cooling scheme (i.e. raised floor environments) but in some cases where data centers have previously installed high-power density systems, alternative cooling solutions may need to be explored by the customer. Since no such system has been available previously, HP teamed with Liebert to develop an innovative data room cooling solution called DataCool. DataCool is a patented overhead climate system utilizing fluid based cooling coils and localized blowers capable of cooling heat loads of several hundred watts per square foot. Some of DataCool's highlights are listed below:
- Liebert has filed for several patents on DataCool
- DataCool, based on Liebert's TeleCool, is an innovative approach to data room cooling
- Liquid cooling heat exchangers provide distributed cooling at the point of use
- Delivers even cooling throughout the data center preventing hot spots
- Capable of high heat removal rates (500 W per square foot)
- Floor space occupied by traditional cooling systems becomes available for revenue generating equipment.
- Enables cooling upgrades when installed in data rooms equipped with raised floor cooling

DataCool is a custom-engineered overhead solution for both new data center construction and for data room upgrades for high heat loads. It is based on Liebert's TeleCool product, which has been installed in 600 telecommunications equipment rooms throughout the world. The system utilizes heat exchanger pump units to distribute fluid in a closed system through patented cooling coils throughout the data center. The overhead cooling coils are highly efficient heat exchangers with blowers that direct the cooling where required. The blowers are adjustable to allow flexibility for changing equipment placement or room configurations. Equipment is protected from possible leaks in the cooling coils by the patented monitoring system and purge function that detects any leak and safely purges all fluid from the affected coils. DataCool has interleaved cooling coils to enable the system to withstand a single point of failure and maintain cooling capability.

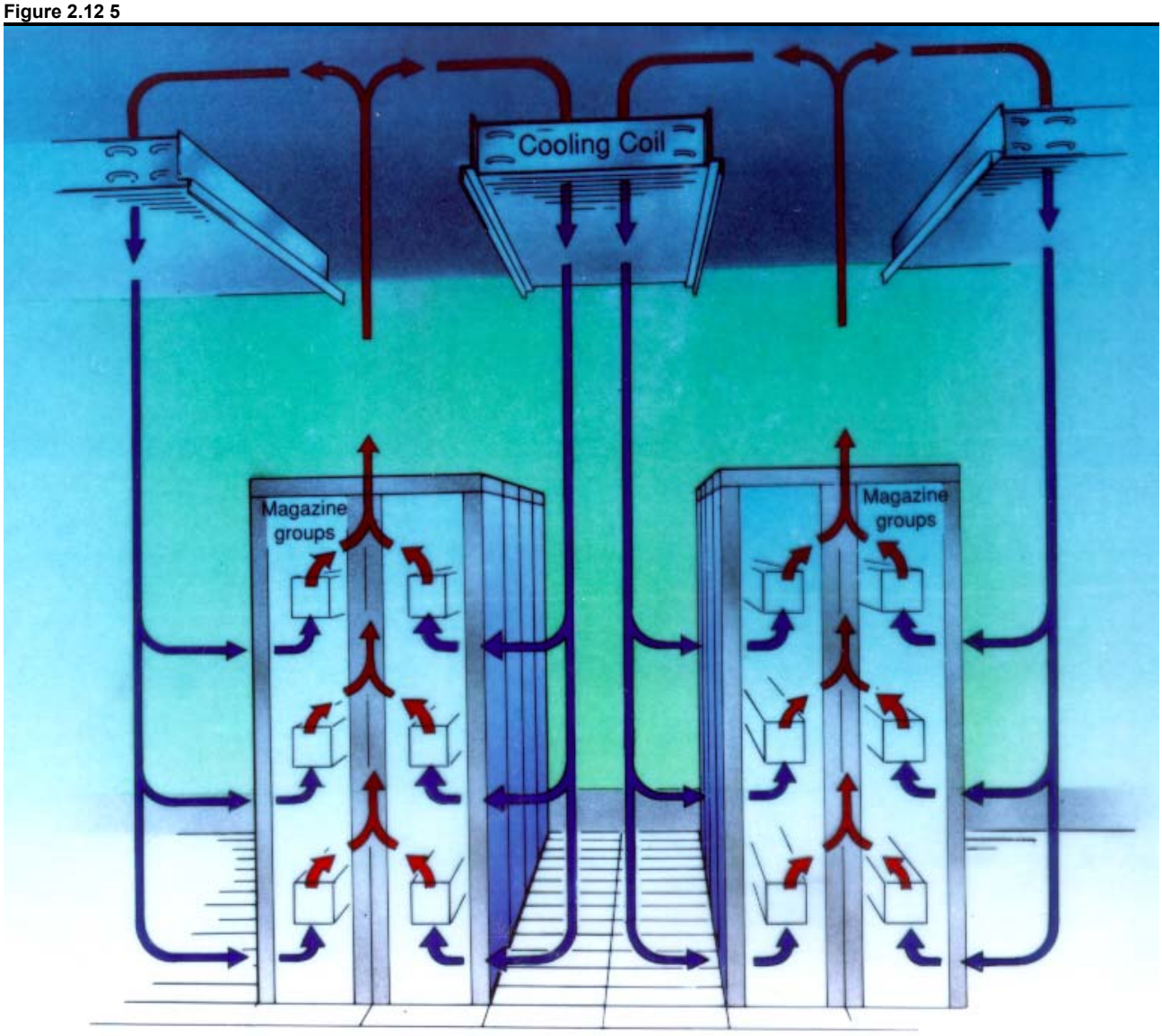
Features and Benefits:
- Fully distributed cooling with localized distribution
- Even cooling over long distances
- High heat load cooling capacity (up to 500 W per square foot)
- Meets demand for narrow operating temperature for computing systems
- Allows computer equipment upgrade for existing floor cooled data rooms
- Floor space savings from removal of centralized air distribution
- Withstand single point of failures

For more info:
http://www.liebert.com/assets/products/english/products/env/datacool/60hz/bro_8pg/acrobat/sl_16700.pdf

HP has entered into an agreement with Liebert to reference sell the DataCool solution.

- The HP/Liebert business relationship will be managed by HP Complementary Products Division.
- DataCool will be reference by HP. Installation, service and support will be performed by Liebert.
- HP will compensate the HP Sales Representative and District Manager for each DataCool that Liebert sells to a customer referred by HP.
- An HP/Liebert DataCool website will be setup to get more information on the product and to manage the reference sales process. Please go to http://hpcp.grenoble.hp.com/ for more information.

Figure 2.12 5



Environmental

- 20-30 degrees C inlet ambient temperature
- 0-10,000 feet
- 2600 CFM with N+1 blowers. 2250 CFM with N.
- 65 dBA noise level

Uninterruptible Power Supplies (UPS)

HP will be reselling high-end (10-kW and above) three phase UPS systems from our partners. We will test and qualify a three-phase UPS for Superdome. The UPS is planned to be available Q1 FY01.

- All third-party UPS resold by HP will be tested and qualified by HP to ensure interoperability with our systems
- We plan to include ups_mond ups communications capability in the third party UPS(s), thus ensuring consistent communications strategy with our PowerTrust UPS(s)
- We will also establish a support strategy with our third party UPS partners to ensure the appropriate level of support our customer have come to expect from HP.
- For more information on the product and to manage the reference sales process. Please go to http://hpcp.grenoble.hp.com/ for more information.

APC Uninterruptible Power Supplies for Superdome

Description

The Superdome team as qualified the APC Silcon 3-phase 20-kW UPS for Superdome.

There are several configurations that can be utilized depending on the Superdome configuration your customer is deploying. They range from a 64-way Superdome with dual-cord and dual-UPS with main-tie-main to a 32-way Superdome with single-cord and single-UPS. In all configurations the APC Silcon SL20KFB2 has been tested and qualified by the Superdome engineers to ensure interoperability.

Figure 2.12.6 Superdome 64-way UPS Test Configuration—Dual-Cord/Dual UPS with Main-Tie-Main

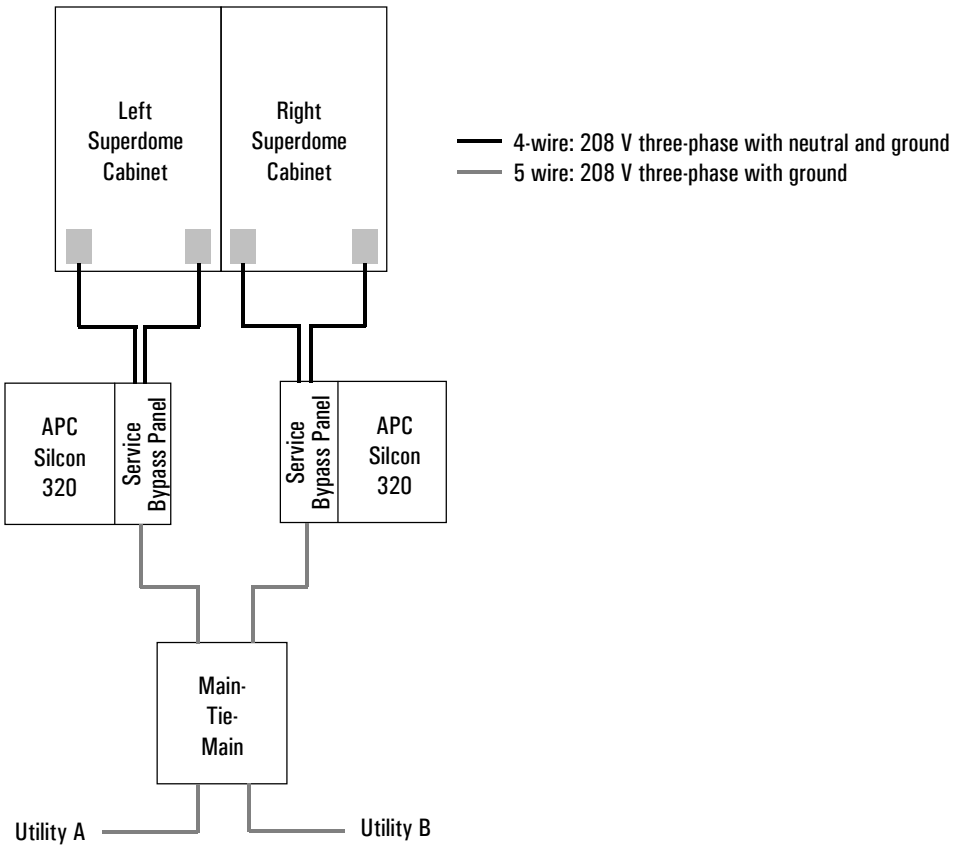


Figure 2.12.7 Superdome 64-way UPS Test Configuration—Single-Cord/Single UPS

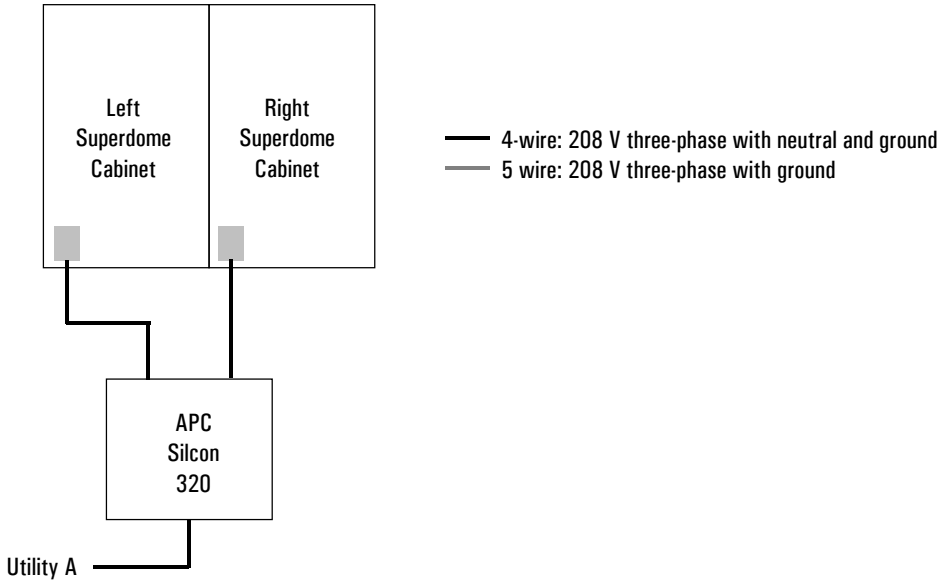

Left Superdome Cabinet
Right Superdome Cabinet
4-wire: 208 V three-phase with neutral and ground
5 wire: 208 V three-phase with ground
APC Silcon 320
Utility A

Figure 2.12.8 Superdome 32-way Test UPS Configuration—Dual-Cord/Dual UPS with Main-Tie-Main

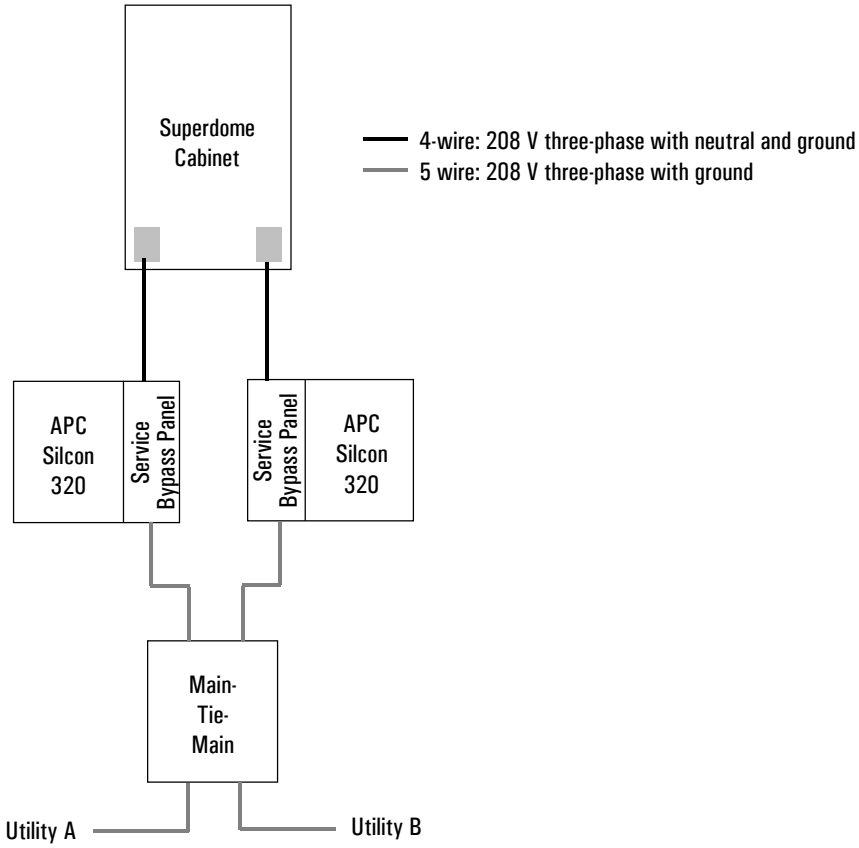


Figure 2.12.9 Superdome 32-way Test UPS Configuration—Single-Cord/Single UPS

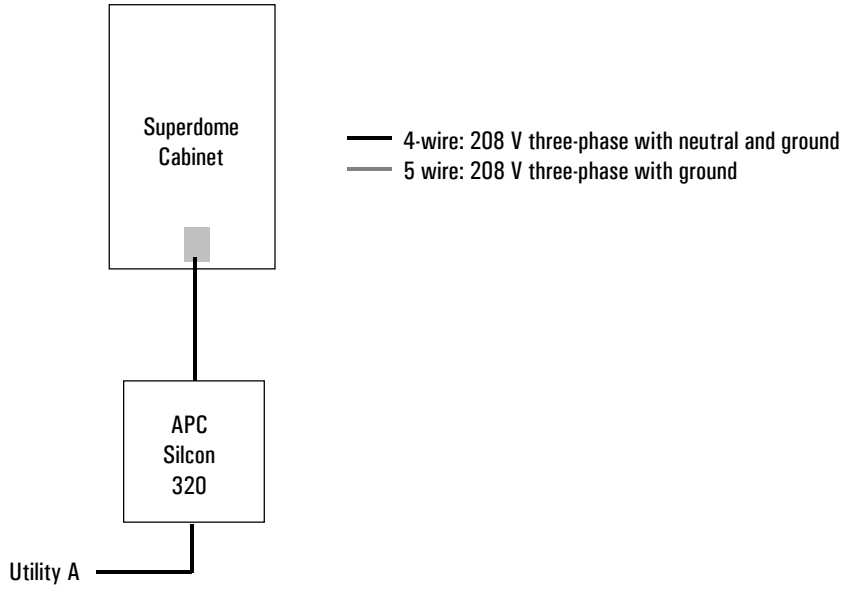

Superdome Cabinet
4-wire: 208 V three-phase with neutral and ground
5 wire: 208 V three-phase with ground
APC Silcon 320
Utility A

Table 2.12.13 HP UPS Solutions

Product Number/ Description	Quantity/Configuration	Watt	VA	Technology	Family	Package	Output
SL20KFB2 APC Silcon 3-phase UPS	• Quantity 2/ 32- or 64-way dual-cord/dual-UPS with main-tie-main • Quantity 1/ 32- or 64-way single-cord/single-UPS	20 kW	20 kVA	Delta conversion on-line double conversion	APC Silcon 3-phase	Standalone rack	Configurable for 200: 208 or 220V 3-phase nominal output voltage
QJB22830 Switch Gear	• Quantity 1/ 32- or 64-way dual-cord/dual-UPS with main-tie-main • Quantity 0/ 32- or 64-way single-cord/single-UPS	N/A	N/A	N/A	Customer Design for Superdome	N/A	N/A
WSTRUP5X8-SL10 Start-Up Service	• Quantity 2/ 32- or 64-way dual-cord/dual-UPS with main-tie-main • Quantity 1/ 32- or 64-way single-cord/single-UPS	N/A	N/A	N/A	N/A	N/A	N/A
WONSITENBD-SL10 Next Business Day On-site Service	• Quantity 2/ 32- or 64-way dual-cord/dual-UPS with main-tie-main • Quantity 1/ 32- or 64-way single-cord/single-UPS	N/A	N/A	N/A	N/A	N/A	N/A

Note: The APC Silcon 3 phase UPS solutions for Superdome must be ordered directly from APC. Please contact Ron Seredian at rseredia@apcc.com.

Table 2.12.14 Superdome Server Watt Ratings for UPS loading

Class	Models	Watt Rating for UPS loading	UPSs Typically Used
Superdome	32 way	19 kW	SL20KFB2; 20 kW/20 kVA
Superdome	64 way	19 kW each cabinet; 38 kW total	SL20KFB2; 20 kW/20 kVA; Quantity 2

Power Protection

Runtimes

The UPS will provide battery backup to allow for a graceful shutdown in the event of a power failure. Typical runtime on the APC SL20KFB2 Silcon 3 Phase UPS varies with the kW rating and the load. The APC SL20KFB2 UPS provides a typical runtime of 36.7 minutes at half load and 10.7 at full load. If additional run time is needed please contact your APC representative

Power Conditioning

The APC SL20KFB2 provides unparalleled power conditioning with its Delta-Conversion on-line double conversion technology. This is especially helpful in regions were power is unstable.

Continuous Power during Short Interruptions of Input Power

The APC SL20KFB2 will provide battery backup to allow for continuous power to the connected equipment in the event of a brief interruption in the input power to the UPS. Transaction activity will continue during brief power outage periods as long as qualified UPS units are used to provide backup power to the SPU, the Expansion Modules, and all disk and disk array products.

UPS Configuration Guidelines

In general, the sum of the "Watt rating for UPS sizing" for all of the connected equipment should not exceed the watt rating of the UPS from which they all draw power. In previous configuration guides, this variable was called the "VA rating for UPS sizing." With Unity Power Factor, the Watt rating was the same as the kVA rating, so it didn't matter which one we used. VA is calculated by multiplying the voltage times the current. Watts, which is a measurement of true power, may be less than VA if the current and voltage are not in phase. APC SL20KFB2 has Unity Power Factory correction, so the kW rating equals the kVA rating. Be sure to add in the needs for the other peripherals and connected equipment. When sizing the UPS, allow for future growth as well. If the configuration guide or data sheet of the equipment you want to protect gives a VA rating, use this as the watt rating. If the UPS does not provide enough power for the additional devices such as system console and mass storage devices, additional UPSs may be required.

Superdome

The only qualified UPS available for use with Superdome is the APC SL20KFB2 Silcon 3 Phase 20-kW UPS. The APC SL20KFB2 can provide power protection for the SPU and peripherals. If the system console and primary mass storage devices (such as HP High Availability Disk Array Model 20) also require power protection (which is highly recommended) they may require one or more additional UPSs depending on the total Watts. Make sure that the total watts do not exceed the UPS's voltage rating.

Integration/Installation

The APC SL20KFB2 includes both field integration start up service and next day on-site service for one year provide by APC.

Power Connections with the APC SL20KFB2

Table 2.12.15 APC SL20KFB2 Power Connections

Product Number	Watts	NOM Out	Output Receptacles	Input Receptacles
SL20KFB2	20 kW	115/200 3PH, 120/208 3PH, 127/220 3PHV	Hardwire	Hardwire

Communications Connections

A DB-25 RS-232 Contact Closure connection is standard on all APC SL20KFB2 UPS. A WEB/SNMP card is also included.

Power Management

Table 2.12.16 APC SL20KFB2 Power Management

Description	Network interface cards that provide standards-based remote management of UPSs
General Features	Boot-P support, Built-in Web/SNMP management, Event logging, Flash Upgradeable, MD5 Authentication Security, Password Security, SNMP Management, Telnet Management, Web Management
Includes	CD with software, User Manual
Documentation	User Manual Installation Guide

Type of UPSs

Some customers may experience chronic "brown-out" situations or have power sources that are consistently at the lower spectrum of the standard voltage range. For example, the AC power may come in consistently at 92 VAC in a 110 VAC area. Heavy-load electrical equipment or power rationing are some of the reasons these situations arise. The APC SL20KFB2 units are designed to kick in before the AC power drops below the operating range of the HP Superdome Enterprise Server. Therefore, these UPS units may run on battery frequently if the AC power source consistently dips below the threshold voltage. This may result in frequent system shutdowns and will eventually wear out the battery. Although the on-line units can compensate for the AC power shortfall, the battery life may be shortened. The best solution is to use a good quality boost transformer to "correct" the power source before it enters the UPS unit.

APC SL20KFB2 Specifications

Table 2.12.17 APC SL20KFB2 Specifications

Description	APC Silcon, 20000VA/20000W, Input 115/200 3PH, 120/208 3PH, 127/220 3PHV/ Output 115/200 3PH, 120/208 3PH, 127/220 3PHV, Interface Port DB-25 RS-232, Contact Closure
General features	0-95% non-condensing, 200% overload capability, Audible Alarms, Built-in static bypass switch, Delta Conversion On-line Technology, Environmental Protection, Event logging, Extendable Run Time, Full rated output available in kW, Input Power Factor Correction, Intelligent Battery Management, LCD Alphanumeric Display, Overload Indicator, Paralleling Capability, Sine-wave output, SmartSlot, Software, Web Management
Includes	Parallel Card, Triple Chassis for three SmartSlots, User Manual, Web/SNMP Management Card
Spare parts kits	See APC website www.apcc.com
Documentation	User Manual and Installation Guide
Input	
Nominal input voltage	115/200 3PH, 120/208 3PH, 127/220 3PH V
Input frequency	50 Hz programmable +/– 0.5, 1, 2, 4, 6, 8%; 60 Hz programmable +/– 0.5, 1, 2, 4, 6, 8%
Input connection type	Hardwire 5-wire (3PH + N + G)
Input voltage range for main operations	170-230 (200 V), 177-239 (208 V), 187-242 (220 V) V
Batteries	
Typical backup time at half load	36.7 minutes
Typical backup time at full load	10.7 minutes
Battery type	Maintenance-free sealed Lead-Acid battery with suspended electrolyte: leak proof
Typical recharge time **	2 hours
Physical	
Maximum height dimensions	55.12 inches (140.00 cm)
Maximum width dimensions	39.37 inches (100.00 cm)
Maximum depth dimensions	31.50 inches (80.01 cm)
Net weight	1,290.00 lbs (586.36 kg)
Shipping Weight	1,340.00 lbs (609.09 kg)
Shipping Height	66.93 inches (170.00 cm)
Shipping Width	43.31 inches (110.00 cm)
Shipping Depth	35.43 inches (90.00 cm)
Color	Dark green (NCS 7020 B50G), Light gray (NCS 2703-G84Y)
Units per Pallet	1.0
Communications and Management	
Interface port	DB-25 RS-232, Contact Closure
Smart Slot Interface Quantity	2
Pre-Installed SmartSlot Cards	AP9606
Control panel	Multi-function LCD status and control console
Audible alarm	Beep for each 52 alarm conditions
Emergency Power Off (EPO)	Yes
Optional Management Device	See APC website www.apcc.com
Environmental	
Operating Environment	0-40 °C (32-104°F)
Operating Relative Humidity	0-95%
Operating Elevation	0-3333 feet (0-999.9 meters)
Storage Temperature	–50-40 °C (–58-104°F)
Storage Relative Humidity	0-95%
Storage Elevation	0-50000 feet (0-15000 meters)
Audible noise at 1 meter from surface of unit	55 dBA
Online thermal dissipation	4,094 BTU/hour
Protection Class	NEMA 1, NEMA 12
Conformance	
Approvals	EN 55022 Class A, ISO 9001, ISO 14001, UL 1778, UL Listed, cUL Listed
Standard warranty	One-year repair or replace, optional on-site warranties available, optional extended warranties available
Optional New Service	See APC website www.apcc.com

* Without TAX/VAT

** The time to recharge to 90% of full battery capacity following a discharge to shutdown using a load rated for 1/2 the full load rating of the UPS

Ordering Guidelines

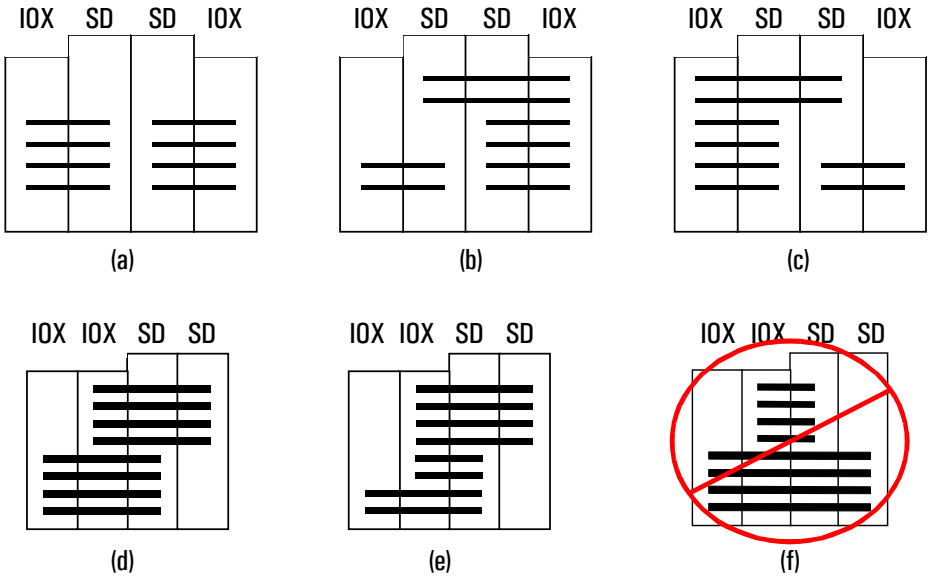
- The APC SL20KFB2 Silcon 3-phase UPS units may be ordered as part of a new Superdome system order or as a field upgrade to an existing system.
- For new systems order please contact APC at Ron Seredian rseredia@apcc.com during the Superdome pre-consulting phase. APC will coordinate with HP to ensure the UPS is installed to meet the Superdome installation schedule.
- For field upgrades please contact APC at Ron Seredian rseredia@apcc.com when you determine a customer is in need and/or interested in power protection for Superdome. APC will coordinate with the customer to ensure the UPS is installed to meet their requirements.
- Numerous options can be ordered to compliment APC SL20KFB2 Silcon 3-phase UPS units. Your APC consultant can review these option with you are you can visit the APC website at www.apcc.com

Multi-cabinet Configurations

In order to support the maximum number of PCI slots, a Superdome 64-way system requires 16 I/O chassis. The two Superdome cabinets (left and right) that make up the Superdome 64-way system only provide eight I/O chassis, therefore four I/O chassis enclosures, each with two I/O chassis are needed. The I/O chassis enclosures are placed in the I/O expansion cabinet. Each I/O expansion cabinet supports up to three I/O chassis, so two I/O expansion chassis are needed.

When configuring Superdome systems that consist of more then one cabinet and include I/O expansion cabinets, certain guidelines must be followed, specifically the I/O interface cabling between the Superdome cabinet and the I/O expansion cabinet can only cross one additional cabinet due to cable length restrictions. Refer to **Figure 2.12.10** for examples of the cabinet configurations. Configurations (a - e) are examples of legal configuration while example (f) is an example of an illegal configuration.

Figure 2.12.10 Superdome 64-way Configurations with 2 I/O Expansion Cabinets



Configuration Rules

General

***Note**: The Superdome System Planner applies the rules below for Superdome configurations.*

Rule		Applies to
1.	The first cell in a partition must be connected to an I/O chassis that contains a Core I/O card, a card connected to boot media, a card connected to removable media, and a network card with a connected network.	Cell
2.	Every cell in a Superdome complex must be assigned to a valid physical location.	Cell
3.	A cell may only have memory modules of one size.	Cell
4.	All CPUs in a cell are the same type.	Cell
5.	A partition cannot have more I/O chassis than it has active cells.	Partition I/O
6.	Removable media device controller should be in slot 8 of the I/O chassis.	I/O
7.	Core I/O card should be in slot 0 of the I/O chassis.	I/O
8.	Boot device controller should be in slot 1 of the I/O chassis	I/O
9.	PCI 4X I/O cards should be in 4X slots in the I/O chassis	I/O
10.	Every I/O card in an I/O chassis must be assigned to a valid physical location.	I/O
11.	Every I/O chassis in a Superdome complex must be assigned to a valid physical location	I/O
12.	Every Superdome complex requires a system console and a Support Management Station.	System

Performance

***Note**: The Superdome System Planner applies the rules below for Superdome configurations. Additional performance information is available in the Superdome System Planner.*

Rule		Applies to
1.	The amount of memory on a cell should be evenly divisible by 4 GB, i.e., 4, 8 or 16 GB (8, 16 or 32 DIMMs - 2, 4 or 8 ranks respectively). The cell has two memory busses and DIMMs are installed in ranks of 4 DIMMs. The loading order of the DIMMs alternates the ranks between the busses, i.e., rank 0 is on bus 0, rank 1 is on bus 1, rank 2 is on bus 0, rank 3 is on bus 1, etc... This rule provides maximum memory bandwidth on the cell, by equally populating both memory busses. This rule also provides optimal interleaving of the memory on the cell, which requires that the number of ranks be a power of 2.	Cell (Memory)
2a.	All cells in a partition should have the same number of processors.	Cell (CPU))
2b.	The number of active CPUs per cell should be balanced across the partition, however minor differences are OK. (Example: 4 active CPUs on one cell and three active CPUs on the second cell)	Cell (CPU)
3.	All cells in a partition should have the same amount of memory (symmetric memory loading) Asymmetrically distributed memory affects the interleaving of cache lines across the cells. Asymmetrically distributed memory can create memory regions that are non-optimally interleaved. Applications whose memory pages land in memory interleaved across just one cell can see up to 16 times less bandwidth than ones whose pages are interleaved across all cells.	Cell (Memory)
4.	If a partition contains 4 or fewer cells, all the cells should be linked to the same crossbar (quad) in order to eliminate bottlenecks and the sharing of crossbar bandwidth with other partitions. In each Superdome cabinet, slots 0, 1, 2 and 3 link to the same crossbar and slots 4, 5, 6 and 7 link to the same crossbar.	Cell Partition
5.	A Core I/O card should not be selected as the main network interface to a partition. A Core I/O card is a PCI 1X card that possibly produces lower performance than a comparable PCI 2X card.	Partition I/O
6.	A partition should have a power of two number of cells (2, 4, 8 or 16) The number of cells in a partition should be a power of two, i.e., 2, 4, 8, or 16. Optimal interleaving of memory across cells requires that the number of cells be a power of two. Building a partition that does not meet this requirement can create memory regions that are non-optimally interleaved. Applications whose memory pages land in the memory that is interleaved across just one cell can experience up to 16 times less bandwidth than pages which are interleaved across all 16 cells.	Partition

Rule	Applies to
7. Before consolidating partitions in a Superdome 32-way or 64-way system, the following link load calculation should be performed for each link between crossbars in the proposed partition. Links loads less then 1 are best. As the link load begins to approach 2 performance bottlenecks may occur. For crossbars X and Y Link Load = Qx * Qy / Qt / L, where – Qx is the number of cells connected to crossbar X (quad) – Qy is the number of cells connected to crossbar Y (quad) – Qt is the total number of cells in the partition – L is the number of links between crossbar X and Y (2 for Superdome 32-way systems and 1 for Superdome 64-way systems)	Partition

Single-system High Availability

***Note**: The Superdome System Planner applies the rules below for Superdome configurations.*

Rule	Applies to
1. Each cell should have at least two active CPUs.	Cell (Processor)
2. Each cell should have at least 4 GB (8 DIMMs) of memory.	Cell (Memory)
3. I/O chassis ownership must be localized as much as possible. One way is to assign I/O chassis to partitions in sequential order starting from INSIDE the single cabinet, then out to the I/O expansion cabinet 'owned' by the single cabinet.	I/O
4. I/O expansion cabinets can be used only when the main system cabinet holds maximum number of I/O card cages. Thus, the cabinet must first be filled with I/O card cages before using an I/O expansion cabinet.	I/O
5. Single cabinets connected to form a dual cabinet (using flex cables) should use a single I/O expansion cabinet if possible. However, if two I/O expansion cabinets are present see #4.	I/O
6. Spread enough connections across as many I/O chassis as it takes to become 'redundant' in I/O chassis'. In other words, if an I/O chassis fails, the remaining chassis have enough connections to keep the system up and running, or in the worst case, have the ability to reboot with the connections to peripherals and networking intact.	I/O
7. All SCSI cards are configured in the factory as unterminated. Any auto termination is defeated. If auto termination is not defeatable by hardware, the card is not used at first release. All the cards planned for first release meet these criteria (A4800A, A5159A). Terminated cable would be used for connection to the first external device. In the factory and for shipment, no cables are connected to the SCSI cards. In place of the terminated cable, a terminator is placed on the cable port to provide termination until the cable is attached. This is needed to allow HP-UX to boot. The customer does not need to order the terminators for these factory integrated SCSI cards, since the customer will probably discard them. The terminators are provided in the factory by use of constraint net logic.	I/O
8. Partitions whose I/O chassis are contained within a single cabinet have higher availability than those partitions that have their I/O chassis spread across cabinets.	I/O Partition
9. A partition's core I/O chassis should go in a system cabinet, not an I/O expansion cabinet	I/O Partition
10. A partition should be connected to at least two I/O chassis containing Core I/O cards. This implies that all partitions should be at least 2 cells in size. The lowest number cell or I/O chassis is the 'root' cell, the second lowest number cell or I/O chassis combo in the partition is the 'backup root' cell.	I/O Partition
11. A partition should consist of at least two cells.	Partition
12. Not more than one partition should span a cabinet or a crossbar link. When crossbar links are shared, the partition is more at risk relative to a crossbar failure that may bring down all the cells connected to it.	Partition

Multi-system High Availability

Any Superdome partition that is protected by MC/ServiceGuard or ServiceGuard OPS Edition can be configured in a cluster with:

- another Superdome
- one or more standalone non-Superdome systems
- another partition within the same single cabinet Superdome (refer to "Cluster-in-a-Box" for specific requirements)

Separate partitions within the same Superdome system can be configured as part of different ServiceGuard clusters.

***Note**: For additional MC/ServiceGuard information please refer to **Chapter 6**.*

Traditional Multi-system Configuration Rules (for Superdome 16-way, 32-way, and 64-way systems)

- A single Superdome system contains single points of failure (SPOFs). The single points of failure are the system clock, the system backplane and the power monitor
- To configure a cluster with no SPOF, the membership must extend beyond a single cabinet. The cluster must be configured such that the failure of a single cabinet does not result in the failure of a majority of the nodes in the cluster. The cluster lock device must be powered independently of the cabinets containing the cluster nodes.
- A cluster lock is required if the cluster is wholly contained within two single cabinets (i.e., two 16-way or 32-way systems) or two dual cabinets (i.e. two 64-way systems). This requirement is due to a possible 50% cluster failure.
- MC/ServiceGuard only supports cluster lock up to four nodes. Thus a two-cabinet configuration is limited to four nodes (i.e., two nodes in one dual cabinet 64-way system and two nodes in another dual-cabinet 64-way system).
- Two-cabinet configurations must evenly divide nodes between the cabinets (i.e. 3 and 1 is not a legal 4-node configuration).
- Cluster lock must be powered independently of either cabinet.
- Dual power connected to independent power circuits is recommended.
- Root volume mirrors must be on separate power circuits.
- Redundant heartbeat paths are required and can be accomplished by using either multiple heartbeat subnets or via standby interface cards.
- Redundant heartbeat paths should be configured in separate I/O chassis when possible.
- Redundant paths to storage devices used by the cluster are required and can be accomplished using either disk mirroring or via LVM's pvlinks.
- Redundant storage device paths should be configured in separate I/O chassis when possible.

Mixed System Configuration Rules (for mixed Superdome and non-Superdome clusters)

- Cluster configurations can contain a mixture of Superdome and non-Superdome nodes (i.e. a 4-node cluster comprised of a single cabinet Superdome with two partitions and two N-Class servers).
- Care must be taken to configure an even or greater number of nodes outside of the Superdome cabinet
- If half the nodes of the cluster are within a Superdome cabinet, a cluster lock is required (4-node maximum cluster size)
- If more than half the nodes of a cluster are outside the Superdome cabinet, no cluster lock is required (16-node maximum MC/ServiceGuard cluster size).

MC/ServiceGuard Single-System HA Capability on Superdome

"MC/ServiceGuard-in-a-Box" Configuration

On Superdome, a new configuration of MC/ServiceGuard can increase single-system availability. The "MC/ServiceGuard-in-a-Box" allows for failover of users' applications between partitions on a single Superdome system (up to 64-way).

All providers of mission-critical solutions agree that failover between clustered systems provides the safest availability—no single points of failures (SPOFs) and no ability to propagate failures between systems. However, HP supports the configuration of MC/ServiceGuard in a single system to allow the highest possible availability for those users that need the benefits of a non-clustered solution, such as scalability and manageability. Superdome with MC/ServiceGuard-in-a-Box will provide the greatest single system availability configurable. Since no single-system solution in the industry provides protection against a SPOF, users that still need this kind of safety and HP's highest availability should use MC/ServiceGuard in a multiple-system HA configuration.

The following rules apply to "MC/ServiceGuard-in-a-Box" configuration:

- The "MC/ServiceGuard-in-a-box" configuration contains single points of failure (SPOFs) that will bring down the entire cluster.
- Up to a 4-node cluster is supported within a single cabinet 16-way system
- Up to an 8-node cluster is supported within a single cabinet 32-way system*
- Up to a 16-node cluster is supported within a dual cabinet 64-way system*
- Cluster lock is required for 2-node configurations
- Cluster lock must be powered independently of the cabinet.
- Dual power connected to independent power circuits is highly recommended.
- Root volume mirrors must be on separate power circuits.

* *32-way system requires an I/O expansion cabinet for greater than 4 nodes. 64-way system requires an I/O expansion cabinet for greater than 8 nodes.*

Multiple ServiceGuard clusters can be configured within a single Superdome system (i.e., two 4-node clusters configured within a 32-way Superdome system).

Disaster Tolerant Cluster Configurations

The following Disaster Tolerant Cluster solutions fully support cluster configurations using Superdome systems. The existing configuration requirements for non-Superdome systems also apply to configurations that include Superdome systems. An additional recommendation, when possible, is to configure the nodes of cluster in each datacenter within multiple cabinets to allow for local failover in the case of a single cabinet failure. Local failover is always preferred over a remote failover to the other datacenter. The importance of this recommendation should increase as the geographic distance between datacenters increases.

- Campus Clusters using MC/ServiceGuard
- MetroCluster with Continuous Access XP
- MetroCluster with EMC SRDF
- ContinentalClusters

***Note**: From an HA perspective, it is always better to have the nodes of an HA cluster spread across as many system cabinets (Superdome and non-Superdome systems) as possible. This approach maximizes redundancy to further reduce the chance of a failure causing down time.*

I/O Expansion Cabinet

The I/O expansion functionality is physically partitioned into four rack-mounted chassis—the I/O expansion utilities chassis (XUC), the I/O expansion rear display module (RDM), the I/O expansion power chassis (XPC) and the I/O chassis enclosure (ICE). Each ICE supports up to two 12-slot PCI chassis.

Field Racking

The only field rackable I/O expansion components are the ICE and the 12-slot PCI chassis. Either component would be field installed when the customer has ordered additional I/O capability for a previously installed I/O expansion cabinet.

No I/O expansion cabinet components will be delivered to be field installed in a customer's existing rack other than a previously installed I/O expansion cabinet. I/O expansion components are not designed for installation in RBI, Compaq, Rittal or other third party racks.

The I/O expansion cabinet is based on a modified HP Rosebowl II-D (RBII-D+) rack and all expansion components mount in the rack. Each component is designed to install independently in the rack The RBII-D cabinet has been modified to allow I/O interface cables to route between the ICE and cell boards in the Superdome cabinet. I/O expansion components are not designed to be installed in racks other than RBII-D+. In other words, they are not designed for Rosebowl I, Compaq, Rittal, or other third-party racks. Additionally, I/O expansion components are not designed for installation behind a rack front door. The components are designed for use with the standard RBII-D perforated rear door.

I/O Chassis Enclosure (ICE)

The I/O chassis enclosure (ICE) provides expanded I/O capability for Superdome. Each ICE supports up to 24 PCI slots by using two 12-slot Superdome PCI chassis. PCI chassis installation in the ICE puts the PCI cards in a horizontal position, as in N-Class. An ICE supports one or two 12-slot PCI chassis. The I/O chassis enclosure (ICE) is designed to mount in an RBII-D+ rack and consumes 9U of vertical rack space.

To provide OL* access to PCI cards and hot-swap access for I/O fans, the PCI chassis are mounted on a sliding shelf inside the ICE.

Four (N+1) I/O fans mounted in the rear of the ICE provide cooling for the chassis. Air is pulled through the front as well as the PCI chassis lid (on the side of the ICE) and exhausted out the rear. The I/O fan assembly is hot-swappable. An LED on each I/O fan assembly indicates that the fan is operating.

Cabinet Height and Configuration Limitations

Although the individual I/O expansion cabinet components are designed for installation in any RBII-D+ cabinet, rack size limitations have been agreed upon. IOX Cabinets will ship in either the 1.6-meter (33U) or 1.96-meter (41U) cabinet. In order to allay service access concerns, the factory will not install IOX components higher than 1.6 meters from the floor. Open space in an IOX cabinet will be available for peripheral installation.

Electrical Characteristics

AC Input Power	200-240 VAC, 50/60 Hz
Current requirements at 200V-240V	16 A
Required Power Receptacle	A5499AZ-001 North America A5499AZ-002 International (EC-309)
Typical Maximum Power Dissipation (watts)	2,290
Maximum Power Dissipation (watts)	3,200

Peripheral Support

All peripherals qualified for use with Superdome and/or for use in an RBII-D rack are supported in the I/O expansion cabinet as long as there is available space. Peripherals not connected to or associated with the Superdome system to which the I/O expansion cabinet is attached may be installed in the I/O expansion cabinet.

Server Support

No servers except those required for Superdome system management such as Superdome Support Management Station (A500) or High Availability Observatory may be installed in an I/O expansion cabinet.

Peripherals installed in the I/O expansion cabinet cannot be powered by the XPC. Provisions for peripheral AC power must be provided by a PDU or other means.

Standalone I/O Expansion Cabinet

If an I/O expansion cabinet is ordered alone then an accessory kit is required if the original Superdome was shipped prior to June 1, 2001. This accessory kit provides new side skins that have a cut out for the cables that connect the I/O expansion cabinet to the Superdome, as well as an EMI panel. Field installation of the I/O expansion cabinets can be ordered via option 750 in the ordering guide (option 950 for Platinum Channel partners).

Power Redundancy

Superdome servers, by default, provide an additional power supply for N+1 protection. As a result, Superdome servers will continue to operate in the event of a single power supply failure. The failed power supply can be replaced without taking the system down.

Instant Capacity on Demand (iCOD)

With HP's iCOD solutions, Superdome servers can be populated with high-performance PA-RISC CPUs. It is no longer necessary to pay for the additional CPUs until the customer uses them, and additional CPUs can be activated instantly with a simple command providing immediate increases in processing power to accommodate application traffic demands.

In the unlikely event that a CPU fails, the HP system will replace the failed CPU on the cell board at no additional charge. The iCOD CPU brings the system back to full performance and capacity levels, reducing downtime and ensuring no degradation in performance.

When additional capacity is required, additional CPUs on a cell board can be brought online. The iCOD CPUs are activated with a single command.

Instant Capacity on Demand (iCOD) can be ordered pre-installed on Superdome servers. All cell boards within the Superdome server will be populated with four CPUs and the customer orders the number of CPUs that must be activated prior to shipment.

Description	Product Number
Right-to-use processor for PA-8600 552-MHz processor	A6161A
Right-to-use processor for PA-8700 750-MHz processor	A6441A
iCOD right-to-access processor	A6162A
iCOD enablement for PA-8600 552-MHz processor	A6163A
iCOD enablement for PA-8700 750-MHz processor	A6442A

Note: The combination of A6161A and A6162A must equal 4x the number of cell boards ordered.

The following applies to iCOD on Superdome servers:

- The number of iCOD processors is selected per partition instead of per system at planning/order time.
- At least one processor per cell in a partition must be a purchased processor.
- Processors are deallocated by iCOD in such a way as to distribute deallocated processors evenly across the cells in a partition. There is no way for a Customer Engineer (CE) or an Account Support Engineer (ASE) or a customer to influence this distribution.
- Reporting for the complex is done on a per-partition basis. In other words, all partitions with iCOD processors must be capable of and configured for sending e-mail to HP.
- Processors can be allocated and deallocated instantly or after a reboot at the discretion of the user.
- Beginning with iCOD Client Agent software version B.04.00 (September 2001), a license key must be obtained prior to either activating or deactivating iCOD processors. A free license key is issued once email connectivity with HP has been successfully established from all partitions with iCOD processors.

Below are a few examples of iCOD on Superdome:

Scenario	Order	Quantity
Customer wants to purchase 4 active processors with Foundation Configuration bundle	• A5206A: Cell Board set-up with 4 PA-8600 552-MHz Processors • A6161A, opt 104: Right-to-use processor, Foundation	• A5206A: 1 • A6161A: 4
Customer wants to purchase 3 active processors with Critical Systems Configuration bundle	• A5206A: Cell Board set-up with 4 PA-8600 552-MHz Processors • A6161A, opt 304: Right-to-use processor, Critical Systems • A6162A: iCOD right-to-access processor	• A5206A: 1 • A6161A: 3 • A6162A: 1
Customer wants to purchase 14 active processors with Business Continuity bundle	• A5206A: Cell Board set-up with 4 PA-8600 552-MHz Processors • A6161A, opt 504: Right-to-use processor, Business Continuity Systems • A6162A: iCOD right-to-access processor	• A5206A: 4 • A6161A: 14 • A6162A: 2

Performance Considerations with iCOD:

- Going from one to two to three active CPUs on a cell board gives linear performance improvement
- Going from three to four active CPUs gives linear performance improvement for most applications except some technical applications that push the memory bus bandwidth.
- Number of active CPUs per cell boards should be balanced across partitions. However, minor differences are okay. (example: four active CPUs on one cell board and three active CPUs on the second cell board)
- Note that the iCOD software will do CPU activation to minimize differences of number of active CPUs per cell board within a partition.

Utility or Pay-per-Use Program

HP Utility Pricing allows financial decisions on investments to be postponed until sufficient information is available. It allows customers to align their costs with revenues, thereby allowing customers to transition from fixed to variable cost structures. This more flexible approach allows customers to size their compute capacity consistent with incoming revenues and Service Level Objectives. HP Utility Pricing encompasses just-in-time purchased capacity, pay per forecast based on planned usage, as well as pay per use via metered usage. All offerings are industry leading performance solutions to our customers.

This program was introduced in July 2001 on HP's powerful Superdome and IA-32 servers. Customers are able to pay for what they use with this new processing paradigm. The usage payments are comprised of both fixed and variable amounts, with the latter based on average monthly CPU usage. Additionally, with HP retaining ownership of the server, technology obsolescence and underutilized processing assets are no longer a customer concern. This is the cornerstone of HP's pay-as-you-go Utility Pricing. Customers will be able to benefit from their servers as a "compute utility". Customers will choose when to apply additional CPU capacity and will only be charged when the additional processing power is utilized. Real-life examples of processing profiles that benefit from Pay per Use are season spikes and month-end financial closings.

The utility program is **mutually exclusive** with iCOD. In order to take part in this program, the utility metering agent (T1322AA) must be ordered.

Upgrades

Upgrade Availability

Table 2.12.18 Add-on Upgrades

Component	Availability
Cell Board and CPUs (A5206A and A6161A)	Immediate
Memory (A5198A)	Immediate
PCI Chassis (A4856A)	Immediate
Redundant PDCA (A5800A)	Immediate

Table 2.12.19 Model Upgrades

Component	Availability
Superdome 16-way to 32-way	Immediate
Superdome 32-way to 64-way	Immediate
Superdome I/O Expansion Cabinet	Immediate

Upgrade Quick Matrix

Table 2.12.20 Model Upgrade Requirements

Model Upgrade	Product Number	Configuration Detail Required	Comments
Superdome 16-way to 32-way	A5204A (includes new system backplane)	• Serial number • Existing partition configuration (cell placement, iCOD, OE license type) • Media requirements (new DVD, SCSI converter, etc.)	• Solution Manager and Deployment Manager • High level design, recommended detailed design • Order entry process through SBW/Watson Config (recommended to identify impact of cell placement, additional software license, etc.) • Installation of new backplane included. For additional add-on components, see table below.
Superdome 32-way to 64-way	A5202A (right cabinet) must be ordered. Options #103, #303 or #503 will be required for the upgrade. The upgrade includes the right cabinet and integrated cells, CPUs, memory and I/O chassis. Note: At least one cell board (A5206A/A6445A) with one active processor (A6161A), one memory DIMM (A5198A), one I/O Card Cage (A4856A) and one PCI Core I/O Card (A5210A)[1] must be ordered when ordering a Superdome 32-way to 64-way upgrade.	• Serial number • Existing partition configuration (cell placement, iCOD, OE license type) • Media requirements (new DVD, SCSI converter, etc.)	• Solution Manager and Deployment Manager • High level design, detailed design • Order entry process through SBW/Watson Config and Convert-to-Order required to place cells in correct slot locations • Installation included. For additional add-on components, see table below.

[1] The PCI Core I/O Card A5210A will be replaced by A6865A as of March 1, 2002.

Table 2.12.21 Add-on Upgrade Requirements

Component Upgrade	Product Number	Configuration Detail Required	Comments
Memory	• A5198A • H4725A #587 (installation)	• Cell count within each partition • Memory on each cell board • Desired location of ordered memory	• No Solution Manager, but optional Deployment Manager • High level design, but no detailed design • Standard order entry process • Memory is field-installed into existing or new cell boards
I/O Card Cage	• A4856A • H4725A #588 (installation)	• Partition info (cell configuration, I/O card cage and I/O cards)	• No Solution Manager, but optional Deployment Manager • High level design, but no detailed design • Standard order entry process
I/O Cards	Depends on I/O card being ordered	• Validate there are sufficient slots within existing card cage	• No Solution Manager, but optional Deployment Manager • High level design, but no detailed design • Standard order entry process • I/O cards are field installed into card cages
Redundant PDCA	• A5800A • H4725A #589 (installation)	• Validate there is an open slot for redundant PDCA	• No Solution Manager, but optional Deployment Manager • High level design, but no detailed design • Standard order entry process
Cell Board into existing partition	• A5206A/A6445A • H4725A #586	• Serial number • Existing partition configuration (cell placement, iCOD, OE license type)	• Solution Manager optional, Deployment Manager recommended • High level design, but no detailed design • Order entry process through Watson Config (recommended to identify impact of cell placement) • Installation does not include any partition reconfiguration.
New Partition	• A5206A/A6445A • H4725A #586	• Serial number • Existing partition configuration (cell placement, iCOD, OE license type) • Media requirements (i.e. new DVD, SCSI converter, etc.)	• Solution Manager optional, Deployment Manager recommended • High level design, recommended detailed design • Order entry process through Watson Config (recommended to identify impact of cell placement, additional software license, etc.) • Installation does not include any partition reconfiguration

Table 2.12.22 Benefits of Optional Services

Optional Service	Benefits
Solution Manager for adding cells into existing partition or creating a new partition	Enhance TCE by coordinating all of HP's resources focused on fulfilling the customer's solution.
Detailed Design for component add-on and Superdome 16-way to 32-way upgrade	Ensures a properly configured solution with the add-on or upgrade. Provides pre-installation planning for partition reconfiguration and operating environment installation. Minimizes impact to production and reduces customer risk.
Deployment Manager for add-on component	Extend Total Customer Experience by proactively managing/scheduling all field resources required to install and integrate the hardware and to re-partition the environment, if required.

Add-on Installation Services

- I/O cards are the ONLY Superdome add-on components that are customer-installable. However, HP-assisted installation is an available option.
- All other Superdome add-on components (cell boards, memory, I/O chassis, PDCA) require HP installation.
- Installation options are ordered one per installed product.
- Add-on installation products are as follows:
  - H4725A #586: Cell board installation
  - H4725A #587: Memory installation
  - H4725A #588: PCI chassis and PCI Core I/O installation
  - H4725A #589: Redundant PDCA installation

Superdome 16-way to 32-way Upgrade

- Includes Deployment Manager services and installation of the new system backplane.
- Installation for any additional items into the cabinet should be ordered using the add-on process.
- Does not include any partition reconfiguration or new partition creation/OS load.
- Does not require site readiness or preparation

Superdome 32-way to 64-way Upgrade

- Includes:
  - Detailed Design
  - Deployment Manager services
  - Site Environmental Services
  - Right cabinet
- Factory installation of internal components (cell boards, memory, PCI chassis, I/O cards and redundant PDCA) into the right cabinet
- Items for the left cabinet should be ordered using the add-on installation options.
- Does not include partition reconfiguration or new partition creation/OS load.

Superdome 32-way to 64-way Minimum Order Requirements

The requirements below are in place to facilitate delivering the right cabinet with a high level of product quality:

- Quantity 1 cell board (1 active CPU minimum)
- Quantity 1 memory module (2 GB, set of 4 512-MB DIMMs)
- Quantity 1 PCI chassis
- Quantity 1 core I/O card

iCOD for Add-on and Upgrades

- iCOD may be ordered on add-on cell boards, Superdome 16-way to 32-way upgrade and Superdome 32-way to 64-way upgrade.
- At least one CPU must be active (purchased) per cell boards.
- The iCOD client agent license should be ordered, B9073AA.

Process Details

- The customer's current system configuration is required for all add-ons (except I/O cards) and upgrades to ensure an accurate design and proper installation:
  - For CSS and BCS customers, the on-site ASE collects this data.
  - Foundation customers may choose to have HP collect the data or provide it themselves. Customer-viewable documentation on extraction of this data will be available.
- TCO uses the current configuration information to accurately document the placement of component add-on and model upgrades. Ultimately, this information is provided to the installation CE.
- New Watson Configurator/SBW functionality allows for an easy process to upgrade from the original system configuration.
  - The current configuration data is entered into the tool, the "Upgrade" option select and only the add-on component or model upgrade products are quoted.
- Watson Configuration/SBW tools are required as follows:
  - For an add-on component, not required to use Watson Configurator/SBW to create configuration, but highly recommended to identify optimal component placement
  - For a Superdome 16-way to 32-way upgrade, not required to use Watson Configurator/SBW to create configuration, but highly recommended to identify optimal component placement
  - For a Superdome 32-way to 64-way upgrade, required to use Watson Configurator/SBW and Convert-to-Order to enable correct placement of cell boards and I/O within right cabinet.

Upgrade Examples

Add-on Upgrade Example

Customer wants to add the following into an existing partition in a Superdome 32-way system:
- 2 cell boards with 4 active and 4 iCOD CPUs
- 16-GB memory
- redundant PDCA
- 1 PCI chassis with core I/O

Order:

Quantity	Product Number	Option Number	Description
2	A6445A		Cell board with four CPUs
4	A6441A		Right-to-use processor for PA-8700 750-MHz
4		304	CS configuration
4	A6162A		iCOD right-to-access processor
1	B9073AA		CPU iCOD agent license
8	A5198A		2-GB memory module (4× 512MB)
1	A4856A		12-slot PCI card cage
2	A5210A[1]		PCI core I/O card
1	A5800A		PDCA redundant power source
1		007	200-240 VAC 3-phase, 5-wire with power cord
4	B9090AC		HP-UX enterprise OE LTU—1 CPU with system
1	H4725A		Installation—system and network
2		586	Superdome cell board installation
8		587	Superdome memory installation
1		588	Superdome PCI card cage installation
1		589	Superdome redundant PDCA installation

[1] The PCI Core I/O Card A5210A will be replaced by A6865A as of March 1, 2002.

Model Upgrade Example #1

Customer wants to upgrade a Superdome 16-way to Superdome 32-way and add the following into an existing partition in a Superdome 16-way cabinet:

- 4 cell boards with 8 active and 8 iCOD CPUs
- 32-GB memory
- redundant PDCA
- 2 PCI chassis with 2 core I/O cards

Order:

Quantity	Product Number	Option Number	Description
1	A5204A		Superdome 16-way to 32-way upgrade
		750	Superdome 16-way to 32-way upgrade available to all customers except OEMs
4	A6445A		Cell board with four CPUs
8	A6441A		Right-to-use processor for PA-8700 750-MHz
8		304	CS configuration
8	A6162A		iCOD right-to-access processor
16	A5198A		2-GB memory module (4× 512MB)
2	A4856A		12-slot PCI card cage
2	A5210A[1]		PCI core I/O card
1	A5800A		PDCA redundant power source
1		007	200-240 VAC 3-phase, 5-wire with power cord
8	B9090AC		HP-UX enterprise OE LTU—1 CPU with system
1	B9073AA		CPU iCOD agent license
1	H4725A		Installation—system and network
4		586	Superdome cell board installation
8		587	Superdome memory installation
2		588	Superdome PCI card cage installation
1		589	Superdome redundant PDCA installation

[1] The PCI Core I/O Card A5210A will be replaced by A6865A as of March 1, 2002.

Model Upgrade Example #2

Customer wants to upgrade a Superdome 32-way to Superdome 64-way and add the following into an existing partition in a Superdome 64-way cabinet:

- 4 cell boards with 16 active CPUs
- 16-GB memory
- 2 PCI chassis with 12 I/O cards

Order:

Quantity	Product Number	Option Number	Description
1	A5200A		HP 9000 Superdome Server solution
1	A5202A		Superdome 32-way add-on cabinet
1	A5202A	005	200-240 VAC 3-phase, 5-wire
1	A5202A	750	Superdome 32-way to 64-way upgrade
4	A6445A		Cell board setup for PA-8700 750-MHz
4	A5206A	0D1	Factory integration
8	A5198A		2-GB memory module, set of 4× 512MB DIMMs
8	A5198A	0D1	Factory integration
16	A6441A		Right-to-use PA-8700 750-MHz CPU
16	A6441A	104	Foundation configuration
2	A4856A		12-slot PCI chassis
2	A4856A	0D1	Factory integration
2	A4926A		100Base-SX PCI LAN adapter
2	A4926A	0D1	Factory integration
2	A6828A or A6829A		Single-port Ultra160 SCSI or Dual-channel Ultra160 SCSI
2	A6828A or A6829A	0D1	Factory integration
2	A3739B	001	Universal PCI FDDI adapter
2	A3739B	0D1	Factory integration
16	B9088AC		HP-UX OE LTU—1 CPU with system

Model Upgrade Example #3

Customer wants to upgrade a Superdome 32-way to Superdome 64-way and place the following into a new partition in a Superdome 64-way cabinet:

- 4 cell boards with 16 active CPUs
- 32-GB memory
- 2 PCI chassis with a core I/O card and 5 I/O cards

Customer wants to also add the following in existing cabinet:

- 16-GB memory
- SCSI converter and cable for existing media device

Order:

Quantity	Product Number	Option Number	Description
1	A5200A		HP 9000 Superdome Server solution
1	A5202A		Superdome 32-way add-on cabinet
1	A5202A	006	200-240 VAC 3-phase, 4-wire
1	A5202A	750	Superdome 32-way to 64-way upgrade
4	A6445A		Cell board setup for PA-8700 750-MHz
4	A5206A	0D1	Factory integration
16	A5198A		2-GB memory module, set of 4 × 512MB DIMMs
16	A5198A	0D1	Factory integration
16	A6441A		Right-to-use PA-8700 750-MHz CPU
16	A6441A	104	Foundation configuration
2	A4856A		12-slot PCI chassis
2	A4856A	0D1	Factory integration
1	A5210A[1]		PCI core I/O card
1	A5210A	0D1	Factory integration
2	A4800A		PCI FWD SCSI-2 card for HP 9000 servers
2	A4800A	0D1	Factory integration
1	C4316A		HP SCSI bus converter
1	A3401A		SCSI cables for HP storage solutions
1	A3401A	851	V-Class 10-meter 68-pin HD InLine Term cable
1	A6828A or A6829A		Single-port Ultra160 SCSI or Dual-channel Ultra160 SCSI
1	A6828A or A6829A	0D1	Factory integration
16	B9088AC		HP-UX OE LTU—1 CPU with system
8	A5198A		2-GB memory module, set of 4 × 512MB DIMMs
1	H4725A		Installation—system and network
8		587	Superdome memory installation

[1] The PCI Core I/O Card A5210A will be replaced by A6865A as of March 1, 2002.

Model Upgrade Example #4

Customer wants to upgrade a Superdome 32-way to Superdome 64-way and place the following into a new partition spanning across the existing cabinet and new Superdome 64-way cabinet:

- 8 cell boards with 32 active CPUs
- 64-GB memory
- 4 PCI chassis with 5 core I/O cards and 5 I/O cards

Customer wants to also add the following and reconfigure existing partition across both cabinets:

- SCSI converter and cable for existing media device

Order:

Quantity	Product Number	Option Number	Description
1	A5200A		HP 9000 Superdome Server solution
1	A5202A		Superdome 32-way add-on cabinet
1	A5202A	006	200-240 VAC 3-phase, 4-wire
1	A5202A	750	Superdome 32-way to 64-way upgrade
6	A6445A		Cell board setup for PA-7600 750-MHz
6	A5206A	0D1	Factory integration
24	A5198A		2-GB memory module, set of 4×512MB DIMMs
24	A5198A	0D1	Factory integration
24	A6441A		Right-to-use PA-8700 750-MHz CPU
24	A6441A	104	Foundation configuration
3	A4856A		12-slot PCI chassis
3	A4856A	0D1	Factory integration
4	A5210A*		PCI core I/O card
4	A5210A	0D1	Factory integration
2	A4800A		PCI FWD SCSI-2 card for HP 9000 servers
2	A4800A	0D1	Factory integration
1	C4316A		HP SCSI bus converter
1	A3401A		SCSI cables for HP storage solutions
1	A3401A	851	V-Class 10-meter 68-pin HD InLine Term cable
1	A6828A or A6829A		Single-port Ultra160 SCSI or Dual Channel Ultra160 SCSI
1	A6828A or A6829A	0D1	Factory integration
24	B9088AC		HP-UX OE LTU—1 CPU with system
2	A6445A		Cell board setup for PA-8700 575052-MHz
8	A5198A		2-GB memory module, set of 4×512MB DIMMs
8	A6441A		Right-to-use PA-8700 750-MHz CPU
8	A6441A	104	Foundation configuration
1	A4856A		12-slot PCI chassis
1	A5210A		PCI core I/O card
2	A4800A		PCI FWD SCSI-2 card for HP 9000 servers
1	H4725A		Installation—system and network
2	H4725A	586	Superdome cell board installation
8	H4725A	587	Superdome memory installation
1	H4725A	588	Superdome PCI chassis installation
8	B9088AC		HP-UX OE LTU—1 CPU with system

[1] The PCI Core I/O Card A5210A will be replaced by A6865A as of March 1, 2002.